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*In light of moving images: technology, creativity  
and lighting in cinematography.*

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Light

*Did you say it's made of waves?*

Yes, that's it.

*I wonder what the waves are made of.*

Oh, waves are made of waves.

Waves are what they are,

Shimmeringness,

Oscillation,

Rhythmical movement which is the inherent essence of all things.

Margaret Tait (1960)

## Abstract

This practice-led doctoral research examines lighting techniques used by cinematographers and more widely amongst practitioners working with moving imagery. The widespread adoption of digital technologies in the film production industry has received a good deal of critical attention from practitioners and scholars alike, however little specific consideration about changing lighting practices can be found amongst this discourse. The control and orchestration of lighting have significant aesthetic connotations for moving image work, so it is surprising that this practice remains an under-explored area in the digital age. Informed by a series of research-driven experimental installations and collaborative cinematography work on independent films, presented in a separate portfolio, this thesis offers an understanding of how light is orchestrated during the production of moving imagery through direct creative inquiry.

The contribution to knowledge made through this doctoral research is distilled into three areas. First, understanding lighting in moving image production through a relational, new-materialist perspective which foregrounds the flow and energy of light as a generative force and a cultural and creative process. Second, providing a more detailed first-hand investigation into lighting processes than is currently available that uses autoethnographic methods to capture practical knowledge that is deployed in situ during moving image production. Third, offering a new approach to the relationship between a cinematographer and his/her equipment by applying

the actor-network theory framework to the consideration of moving image, and explicitly lighting technologies.

The new-materialist perspective outlined in this thesis provides a strong foundation for further studies of lighting in emerging forms of moving image production because of its emphasis on process and a practitioner's correspondence with light. This theoretical framework offers an effective way to understand and analyse creative lighting work across changing technologies, while the insight into practical processes captured during this enquiry can be employed directly in cinematography education.

## Acknowledgements

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whose work is closely related to this enquiry, have both been incredibly generous with their time and willingness to exchange ideas.

I'm grateful to the new communities that welcomed me during the course of this research. The Bristol Experimental and Expanded Film (BEEF) collective helped me exhibit practical projects for wider audiences while the Screenworks editorial team, as well those working in the closely affiliated Digital Cultures Research Centre at UWE, taught me a great deal about academic research. I'm also grateful to the Video Data Bank at School of the Art Institute of Chicago for hosting me in an extended research visit during the summer of 2016, which was financially supported by the 3d3 CDT, and helped significantly during the contextualisation of this research enquiry.

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## **Portfolio of Practice**

Accompanying this written submission is a portfolio of practice formed of two parts. Part 1 is an exhibition catalogue which documents a summative gallery show organised alongside the completion of this practice-led research enquiry. The catalogue also contains background information about each of the eight practical projects (five installations and three short films) presented for examination. Part 2 is a website containing video documentation of these eight projects, demonstrating the outcome of my practical experimentation during this doctoral research.

### **Part 1: In Light of Moving Images Exhibition Catalogue**

**ISBN: 9781860435409**

### **Part 2: Video Documentation, available at:**

**<http://www.inlightofmovingimages.net>**

To guide the reader, this portfolio of practice is referenced in the written thesis through footnotes.



## Chapter 1: Introduction

Cinematography literally means recording movement. Throughout this thesis I bend the term away from its conventional use, which refers to an entire department in the context of collaborative filmmaking, to seek a more creatively-charged meaning that uses the word to address specifically mediated light and the process of lighting that is at the heart of moving image production. Robert Bresson (1975) laid the foundations for alternative perspectives on this discipline in his reflective collection of aphorisms, entitled *Notes on the Cinematographer*, which encompass elements of performance and mise-en-scène just as much, if not more, than the considerations of camera and lighting equipment that tend to dominate discussions of cinematography today. Although Bresson extended the term ‘cinematography’ across a range of disciplines that impact the visual qualities of moving imagery, by contrast, I intend to refine it by offering a new-materialist reading of practitioners’ work which can help to recognise and reclaim some of the more intuitive aspects of cinematography and specifically lighting.

This doctoral research is a practice-led enquiry into moving image lighting which is conducted through theoretical and practical endeavour. In order to investigate the subject fully these strands of enquiry exist in dialogue with one another. As will become clear, the mutual interaction and reinforcement between scholarly activity, film production and creative experimentation are fundamental to the approach and direction of my research. This confluence of activity has been guided by my main Research Question:

1. What is the role of lighting as a creative and cultural process in moving image production?

As well as the following secondary Research Questions:

2. How does technology inform a practitioner's lighting process in moving image production?
3. How can practical investigations contribute to new understandings of moving image lighting?

This project is, in significant ways, a continuation of my undergraduate film education and Master of Fine Arts degree which provided a theoretical and practical grounding, affording the opportunity to familiarise myself with many of the key studies of cinematography while defining my style and approach to creative work. As my practice developed in conjunction with further freelancing on independent film projects, I noticed a disjunction between lighting practices encountered in a production context and the ways these processes were articulated in academic discourse. Striving to improve my lighting abilities I turned to accounts from practicing cinematographers for guidance but quickly grew frustrated with the small, unsystematic and often under-theorised nature of writing about lighting in moving image production. I found that many of the key texts were either significantly outdated, written in the pre-digital filmmaking era<sup>1</sup>, or were predominantly

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<sup>1</sup> Classic lighting texts such as John Alton's (1995) *Painting with Light* or Ross Lowell's (1992) *Matters of Light and Depth* offer practical insight written prior to the development of digital technology and hence necessarily oriented around photochemical processes. While some artistic relevance can be extracted from this writing, there have also been significant changes in filmmaking production processes that require consideration.

anecdotal, often in the form of memoirs<sup>2</sup>, or too reliant on conventional three-point lighting<sup>3</sup> as discussed further in the chapter of this thesis entitled *Sculpting Light* (pp.77-120). My dissatisfaction with the academic sub-field of lighting in cinematography as well as the perceived disparity between this writing about the subject and my personal experiences working as a cinematographer drove this research enquiry and gave rise to Research Question 1.

### 1.1. The Impact of Digitality

The proliferation of new technologies in the production and exhibition of moving imagery is a crucial starting point for my doctoral enquiry. Prior to this research, as a digital native, my understanding of moving imagery developed alongside rapidly changing digital technologies. In contrast to more seasoned practitioners who worked with celluloid when it was the dominant moving image format, I encountered photochemical processes by exploring actively alternative methods for creative and stylistic effect in my cinematography work. These experiences of working across formats spurred my desire to explore further and try to understand the different perspectives surrounding technologies in moving image production, mobilising Research Question 2.

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<sup>2</sup> Nestor Almendros' (1984) *A Man with a Camera* taught me a great deal about the varied production responsibilities of a Director of Photography, while Vittorio Storaro's (2001) *Writing with Light* and Henri Alekan's (1994) *Des Lumières et des Ombres* offer a wealth of creative insight into lighting as discussed in this thesis, however these accounts rely on recollection and personal stories told in hindsight so lack the methodological approach or contextualisation of a research enquiry.

<sup>3</sup> For example, Blain Brown, (2007), David Landau (2014) and Paul Wheeler (2001) all suggest the three-point setup as a starting approach and take a highly technological deterministic perspective on lighting.

During the course of this research enquiry, I convened two panels to address the continued use and relevance of celluloid as opposed to digital production techniques in the film industry. Both events took place at the Arnolfini Centre for Contemporary Arts during the Bristol International Festival of Cinematography in 2015 and 2016.<sup>4</sup> These events brought together practitioners and academics to discuss the topic from their respective vantage points. Chairing these discussions, Andrew Spicer (2016) summarised conventional arguments about this technological debate in his introduction to the second event, suggesting that:

the distinctive social and cultural ritual of watching a theatrically projected film is in the process of being replaced by a diffused continuum in which the viewer or user interacts with a digital artefact in various locations in a multiplicity of ways. Film is no longer singular and separate but only exists in relation to other media; film has lost its 'medium specificity'.

The consensus that emerged during the panels ultimately situated the use of celluloid as a creative choice, suggesting that despite the mainstream adoption of digital technology, from both economic and technical perspectives, there are viable arguments for the continued use of both analogue and digital methods of production. Importantly, these panels also recognised the distinct creative possibilities that each format can afford. This is evidenced in the following comments from several established practitioners during the second event:

I started using film as an art piece not as commercial work. There are things you can do with film that you can't do with digital... I fucked with it a lot to get different stuff, to get reticulation, things you can't get in digital. (Roberto Schaefer ASC, 2016)

It's like oils and watercolours as an artist. You choose the thing that works for the project, the content that you are doing and the thing that you love working with. (Esther May Campbell, 2016)

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<sup>4</sup> Full videos of these panels are available at the following links:  
<https://vimeo.com/255199748/d8c70a3920> and <https://vimeo.com/255200517/da6326748e>

There are various reasons for using one medium or another at different times. Sometimes it cheaper to take a small 16mm [film] camera... than it is to do something with an Alexa [digital camera]. Sometimes it's the other way around. I don't think it's a budget thing between the two. (Nic Knowland BSC, 2016)

In an academic context, the theoretical ramifications, or disruptions, of digital technology in moving image production and exhibition have been widely analysed in the field of film studies. For instance, David Rodowick's *The Virtual Life of Film* (2007), one of the most notable contributions on this topic, offers a comprehensive account of the digitisation of time-based media. He argues that the interpolation of light into discrete binary information, as conducted by digital capture and display processes in cinematography, entails a sensory engagement with moving imagery that is fundamentally distinct to analogue 'filmic' media. In Rodowick's (2007, p.94) view "what appears on electronic and digital screens does not fully conform to the criteria by which in the past we have come to recognize something as a created, aesthetic image". Explaining these changing criteria, he outlines an epistemological rupture, or gap, between the study of analogue and digital forms as the "powers of mutability and velocity of transmission" in digital processes serve to break what had been perceived in analogue production as the temporal and physical connections of imagery to its originating moment of exposure.

When approaching the area of practical digital cinematographic techniques many scholars have ignored this epistemological 'gap'. For instance, John Mateer (2014) suggests that regardless of the tools used, the role of a cinematographer is still centred on the creation of images through an understanding of light, optics and story. He argues that changes in the cinematographic process lie in the nature of

recording and exposing – that the data-centric nature of digital cinema leads practitioners to capture the broadest range of information for manipulation in post-production. Similarly, while focusing on education in moving image practice and associated media disciplines, Peter Kiwitt (2012) argues that in classifying cinema, the methods of production have more significance than whether the capture format was photochemical or digital and whether the result was shown in a theatre or on television. Hence Kiwitt (2012) and Mateer (2014) are both exemplars of a convergent approach, upholding “cinema” as a fixed entity and attempting to fit new production tools into an existing framework of our use of moving imagery, assuming the functioning of the medium and approaches taken by practitioners remain substantially the same.

Moreover, there is a lack of discussion about the developing affordances of emerging technology amongst studies that are focused explicitly on lighting in moving image production and very little recognition of a ‘gap’ between analogue and digital. This is partly because, as I have suggested, many of these former texts were written in a pre-digital era and haphazardly updated in consideration of new production paradigms. Blain Brown’s (2016) *Cinematography: Theory and Practice* is a good example of this, now in its third edition but initially published in 2002 before the full scope and impact of digital technologies in the film industry was evident. Although Brown has made a concerted effort to maintain a current perspective in the subsequent editions of this text, the discussion of lighting across moving image formats is minimal and focused on technical differences. This is evident in the second edition where he suggests “the only difference is that instead of a 12K [light] you

need a 6K, instead of a 10K you can use a 5K and so on” (2012, p.127). While the third edition offers a wider overview of digital exposure and measurement approaches, the sections in which Blain tackles more creative elements of lighting (direction, colour, softness, texture, metaphor, movement etc.) remain largely unchanged in his consideration of the new digital technologies that have become available.

The lack of critical attention to technology is a larger problem amongst lighting discourse as evidenced in David Landau’s (2014) *Lighting for Cinematography*, perhaps the most in depth study of the practice that has originated since the widespread adoption of digital technologies in filmmaking. Landau makes some distinction between working approaches in digital as opposed to photochemical moving image production arguing that “we put light where we want it and take it away from where we don’t want it. We now have more ability to be selective in what we allow the viewer to see” (2014, p.4). In a similar manner to Brown’s writing however, this notion of increased selectivity is premised on the additional sensitivity, or efficiency, of digital sensors as opposed to photochemical processes. Both of these writers suppose the formats operate in the same way, except that digital sensors need less light to create images. While these and other similar texts are useful for their educational value and technical information about equipment, they do not offer a detailed framework or consideration of the ways that creative lighting processes are changing.

Within a critical discussion of lighting technology, the question of medium specificity across analogue and digital moving imagery persists. However, this debate is well

documented elsewhere<sup>5</sup> and so will not be explicitly analysed in this thesis. As a starting point, I acknowledge Rodowick's view regarding the different sensory engagements that these forms of capture and display necessitate. For the practitioner however, the urgency of analogue versus digital debates has dwindled in recent years. As the panel discussions confirmed, any dust that was kicked up by the sudden arrival of digital tools at the turn of the millennium has since settled, resulting in a production landscape where both formats exist with equal, although debatable, economic and technical merits so can be employed based on the practitioner's creative goals. This co-existence between analogue and digital formats as well as the emergence of new technological arenas such as light field photography or 360 degree moving image capture for virtual, augmented and mixed reality content requires a different form of examination that instead looks at technology relationally to identify creative implications of these various production processes.

The transition to digital technologies may have once been understood through a disruption to established notions of medium specificity but in practice it has been accommodated by the proliferation of creative methods. Digitality has given rise to numerous emerging forms of moving imagery resulting in an expanded pallet that

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<sup>5</sup> For example, Enrico Terrone's *The Digital Secret of the Moving Image* (2014) explores the definition of cinema, finding some common terminology between photochemical and digital processes in his argument that moving images are a type that signify the spatiotemporal distribution of pixels, where type refers to a normative establishment of the visual features a correct instance of work ought to exhibit and pixels refer to values of light which can be conveyed by a multiplicity of particular points of light. By contrast, Markos Hadjioannou's *From Light to Byte* (2012) discusses the representational treatment of reality as truthfulness, suggesting that the newness of digital moving imagery lies in how it connotes rather than denotes reality creating a sense of existential withdrawal in both the creator and viewer. Taking another approach, Sean Cubitt's *Making Space* (2010) outlines how the arrangement of light into binary values performed by digital sensors and display technology relates to the Cartesian grid of two-dimensional geometry through a detailed historical discussion of bitmap, colour management and video codecs.



cinematographers such as Emmanuel Lubezki, Jannicke Mikkelsen, David Stump and others are actively embracing alongside conventional filmmaking methods. With the digitisation of capture and display technologies a standardisation of cinematography practice that emerged as part of industrialisation has been surpassed by more complex and fluid ways of orchestrating light which, as I will argue, are best understood through a new-materialist perspective. Rather than revisit the well-rehearsed arguments around medium specificity then, this thesis instead compliments them by understanding different technological tools through direct creative enquiry. In accordance with this, the accompanying portfolio of practice examines the impact of analogue and digital processes on what I term a 'passage of light' and shows how each format becomes entwined in a practitioner's lighting work.

Hence, alongside the main research question has been my drive to recognise and consider the effects of technological changes in filmmaking which has helped to contextualise and provide the momentum for this research enquiry. The chapter of this thesis entitled *Technologies of Light* (pp.120-180) further investigates the discourse surrounding technology in cinematography and offers a new understanding of this shifting landscape through actor-network theory.

### **1.3. Cinematography as a Sub-Field of Film Studies**

At the outset of this doctoral study I explored many possible approaches towards my research enquiry about the use of light in moving image practices. These will be

discussed in this section to introduce and contextualise the research. Current work about lighting in moving imagery is situated in the field of film studies and can be broadly divided into three conventional categories which approach cinematography and light from phenomenological, historical and ethnographic perspectives. As I will outline, none of these perspectives capture the first-hand insight into lighting that is necessary to offer a detailed account of the practical experiences during creative processes - discussed further in the *Methodology* (pp.28-45) section of this thesis. The intention to offer an alternative perspective to these approaches and conduct my enquiry through highly focused creative enquiry led to Research Question 3.

A phenomenological understanding of light has been prevalent since the late 19<sup>th</sup> century and is perhaps best encapsulated by Maurice Merleau-Ponty's writing about perception. He argues that "we perceive in conformity with the light as we think in conformity with other people" and asserts the essential nature of experience as sensual (2002, p.310). In so doing, Merleau-Ponty refuses a Cartesian divide that separates mind and body to propose an embodied ontology in which physicality "actualises" or brings experience into being. As an example of this with regard to the study of lighting, Henry Plummer's (1987) *Poetics of Light* attempts to capture the dramatic qualities of illumination through his eloquent, empathetic and phenomenological descriptions of the various "lightscares" brought forth by particular architectural sites. Extending this approach further to engage specifically with moving imagery, Martha Blassnigg's (2013) edited anthology *Light Image Imagination* deftly navigates concepts of mediation to explore interactions between qualities of light and imagination, thereby focusing on human-centric and often

phenomenological implications across the composition, projection and perception of light. Many chapters in this collection draw upon Henri Bergson's process philosophy which influenced Merleau-Ponty's thinking – a line of thought that is explored further in the chapter of this thesis entitled *Light and/as Material* (pp.45-77). Through a variety of disciplinary approaches, Blassnigg's collection highlights how visual media can reflect our changing existential relationships to the world. However, as with many phenomenological approaches, it does not deal explicitly with the techniques of cinematography and how lighting is orchestrated during a creative, practical process.

Many of the studies which engage directly with cinematography techniques use historical analysis as their overarching approach. The most recent and detailed of these is Laura Thompson's (2017) *Film Light: Meaning and Emotion*, a close reading of the emotional and aesthetic uses of light in cinema which revisits classic films to conduct an analytical overview of the varied illumination practices across film history. In a similar vein, Patrick Keating's (2014) edited collection *Cinematography: A Modern History of Filmmaking*, explores questions of authorship and style across a century of cinematography from the silent era through to contemporary production. Taking a more technologically focused approach in *Film Style and Technology*, Barry Salt (2009) offers an account of the development of filmmaking equipment to suggest the impact these changes had on the visual qualities of films. However, such studies concentrate on mainstream films, often ones produced in the Hollywood system, and hence omit the broader areas of independent, international and artists' moving image production that offer uses of light in a more creative or experimental

fashion. Further to this, as discussed in the chapter of this thesis entitled *Technologies of Light*, the approaches to lighting offered through these historical perspectives tend toward technological determinism and are limited by their position as textual analyses so cannot discuss the implementation of cinematography techniques and choices made during production processes.

By contrast, ethnographic fieldwork and interviews present another dominant strand of enquiry in the study of cinematography which is able to offer insight into practical processes. This approach informs *In the Light of Experience*, a detailed account by Anand Pandian (2013) of the work of a contemporary Indian cinematographer Nirav Shah which discusses his role amidst the bustling filmmaking process. Cathy Greenhalgh's (2010) *Cinematography and Camera Crew* is another significant contribution, which investigates the procedures and structure of production roles during filmmaking processes, again using ethnographic approaches that draw upon interviews as well as her practical insights. It is worth noting, however, that as an anthropologist Pandian writes from a removed, observational perspective on the filmmaking process and although Greenhalgh (2010, p.322) is herself a practicing cinematographer, she purposely evades the subject of lighting which is a "much larger and complicated issue" to instead focus on creative work oriented around the camera crew. The advantages and complications of such ethnographical approaches are addressed further in the *Methodology* chapter of this thesis.

While these approaches have all inspired and informed my research in different ways for the reasons I've indicated, it became clear at the outset of my enquiry that none

of them alone would entirely satisfy the itch that prompted this research, the desire to make an analytic account of the process and significance of lighting throughout the production process. Instead, I have sought to investigate the role of practice in conjunction with my main research question and develop a more nuanced understanding of how light can be orchestrated during the production of moving imagery through highly focused and specific creative enquiry.

Therefore, the combined thesis and portfolio of practice that follow are designed to engage very precisely with the ways that light can be used in practice. I have focused on defining and understanding a creative process that is intrinsic to filmmaking but one which has received little detailed first-hand consideration beyond a small number of cinematographers retrospectively describing their work. What emerges is a personal journey in which my understanding has moved from the notion of light as vision to light as material, from technology as a tool, to technology as a network and from working as a cinematographer to working as an artist. Each small breakthrough that I have gained in this pursuit is related back to the broader discipline of cinematography as a production process to offer some accessibility for practitioners in the field. Ultimately then, this doctoral study represents a reimagining of the practices of a cinematographer, developing into a new perspective on lighting within moving image production, one which harnesses the poetic, expressive and enchanting nature of illumination. As I will demonstrate, this perspective is predominantly informed by new-materialist theory in conjunction with the practical understandings that have developed during my creative work.

## 1.2. Thesis Structure

Addressing my desire to articulate better and understand how, where and why lighting is moulded during the production of moving imagery, this enquiry was designed to capture the variety of processes and possibilities inherent in cinematography practice. As this section will introduce, my research methods and thesis structure arose in pursuit of a more fluid understanding of lighting which could account for the nuanced and creative challenges that I have experienced as a practitioner.

Light has historically and conventionally been understood as a passive force as evidenced in the common terms 'lumen' and 'lux', which represent a duality derived from Renaissance-era notions of a subject-object divide. This heliophilic perspective assumes the individual is epistemologically separated from her or his environment and that s/he perceives that environment physically through objective reflected light. As a counterpoint to this, the chapter of the thesis entitled *Light and/as Material* (pp.45-77) seeks to understand the nature of light in the context of moving image practice and uses a framework of performative materiality, which allows consideration of light as an active force that is implicated in the creation of images with a real physical presence in the world. This perspective opens the possibility for light to be discussed in terms of its material relations and potentialities rather than as a neutral medium affording visibility.

During a contextual phase throughout my first year of research, I explored several theoretical frameworks but found that ultimately material-semiotic perspectives, such as the new materialist work of Karan Barad (2007) and Barbra Bolt (2010) offered the most productive method of conceiving the world, and specifically light, as a boundless series of relations, which married with my autoethnographic findings arising through collaborative cinematography work. *Light and/as Material* describes how these material-semiotic ideas contributed to the intuitive approach to light I'd been seeking and suggests how this discovery of new materialist ideas helped me to unlock or explain practical approaches in which notions of energy, flow and material relations are central to lighting processes.

Through the evaluation of my autoethnographic passages, as well as previously published accounts of production, the new-materialist perspective is directly applied to lighting practices in the chapter of the thesis entitled *Sculpting Light* (pp.77-120). This chapter analyses the processes and activities through which a practitioner works with light to create moving imagery, situating these as distributed acts between technological and environmental affordances in conjunction with the creative intentions of a culturally situated individual.

I considered several methods to interoperate my autoethnographic findings but due to the recognition of mutuality between a perceiver and their environment, found ultimately that ecological psychology, and specifically James Gibson's (1986) notion of affordances, was most effective in explaining entangled lighting processes. *Sculpting Light* suggests how this understanding can go beyond the utilitarianism and

technological dependence of a conventional three-point approach, questioning the standardisation of lighting codified by Hollywood studio era films to offer a more nuanced and relational perspective. Three new concepts toward lighting practice are explained during this discussion; *organisation*, *correspondence* and *association*. These refer to the practitioner's relationship to sources of light, their mechanism of capture and their intended audience, respectively.

Moreover, *Sculpting Light* reassesses the parameters of lighting as a cinematography practice. The notion of affordances provided an effective method to understand an ontological distinction between aesthetic light *within an image* as opposed to the body of light *conveying the image* which featured heavily in the autoethnographic investigation of my experimental installation projects. Using this method of interpretation in conjunction with a new-materialist understanding of light prompted me to outline the notion of a 'passage of light' in this chapter and extend cinematographic considerations of lighting through to the exhibition of moving imagery.

The chapter of this thesis entitled *Technologies of Light* (pp.120-180) furthers my new-materialist discussion of lighting by defining an approach to technology that can enable a comprehensive understanding of the relationship between a practitioner and his or her equipment during moving image production. While analysing my autoethnographic findings, I realised that recognising the influence of equipment during lighting practices pertained to a wider question about how agency should be attributed between practitioner and technology. Subsequently this chapter weighs



the value of social-constructivist and technological-vitalist approaches to moving image production equipment and identifies the need for an account which incorporates elements of both. To reconcile these approaches, I employed actor-network theory as outlined through the work of Michel Callon (1986), Bruno Latour (1996) and John Law (2008) as a lens for studying technology. This framework serves to draw diverse considerations together in recognition of the numerous social and material forces which constitute technologies, therefore coinciding with the relational approach to lighting that is outlined in preceding chapters of the thesis.

The recognition of technological complexity inherent in moving image practices put forward in *Technologies of Light* breaks away from established ways of considering production lighting processes. Previous studies in this area have largely considered lighting fixtures as neutral, objective, tools and therefore exemplify an instrumental perspective on technology which offers a limited view of the ways that creative practitioners work with their equipment. Taking cue from the investigation of analogue and digital forms present in my practical experimentation, *Technologies of Light* outlines how a new-materialist perspective on lighting can recognise better the unique characteristics and predispositions of moving image equipment in order to depict some of the complex technological entanglements involved in lighting practices. Finally, this chapter demonstrates an actor-network understanding of lighting technology through a detailed analysis of the incident light meter.

The concluding chapter of this thesis outlines the contribution made by this doctoral research and identifies areas for further investigation. As each of these core chapters

demonstrates, the combined portfolio of practice and written thesis will contribute to knowledge and understanding in several ways. First, by demonstrating the importance of creative and poetic aspects of lighting in moving image production, understood through a relational, new-materialist perspective. Second, by providing a more detailed first-hand investigation into lighting processes than is currently available, capturing some of the practical knowledge implicit in moving image production. Third, by applying the actor-network theory framework to moving image technologies and through so doing, offering a new approach to the relationship between a cinematographer and his/her equipment.

Cinematography education will be a key application for this research and in particular the conceptual approaches to lighting discussed in *Sculpting Light* can be of direct relevance to those teaching and working in the field. Moreover, this doctoral research lays the foundations for further new-materialist studies of lighting in cinematography. Emerging technologies such as 360-degree video, High Dynamic Range (HDR), Wide Colour Gamut (WCG) and other imminent variations of moving imagery provide new areas for investigation that will be of interest to the academy and industry alike as they become more widely employed as forms of cultural production. Similarly, as filmmaking routinely incorporates more imagery that is digitally generated or manipulated, algorithmic approximations light implicit in these new production methods will bare significant cultural implications that require further investigation. This research indicates the value of a relational understanding of these alternative production methods and emerging moving image formats. The new-materialist perspective on cinematography set out in this thesis is a strong

foundation for studying these emerging forms of production because of its emphasis on process and a practitioner's correspondence with light.

## Chapter 2: Methodology

This doctoral study is situated in a burgeoning field of enquiry known as practice-research or artistic-research which conducts a first-hand engagement with an area of investigation through creative production. My practice involves combining light and camera technology to create moving imagery for a variety of screen contexts. Stemming from my film school education and subsequent freelance work, this process draws heavily on the discipline of cinematography as practiced in an independent and commercial filmmaking context. As suggested in the *Introduction* (pp.9-28), my practice has developed during the course of this doctoral study, leading to a new strand of work which fuses these cinematographic sensibilities with exhibition strategies inspired by expanded cinema and an interest in medium interrogation derived from video art. Hence, my ongoing and emerging creative pursuits equip me with production experiences and predispositions toward lighting which provide a context and site of investigation for this practice-research methodology as explained in more detail below.

Developing autoethnographic methods during my creative work has enabled me to understand research findings systematically from intuitive, collaborative and occasionally chaotic production processes. As I will discuss, the notation that documents the course of my practical work has been embellished and presented in the form of diaristic narrative passages interspersed at appropriate moments within the body of this thesis. An accompanying portfolio of practice gives a fuller picture of

each project, incorporating additional written and visual documentation from various stages of creation to explicate my production processes in more detail.

## **2.1. Practice-Research**

The creation of a series of experimental installation artworks and ongoing participation in collaborative narrative filmmaking projects have been important practical methods for this enquiry. At the outset of the research, my practice was mostly collaborative, rooted firmly in the conventions of narrative cinematography and primarily independent filmmaking. I intended to investigate lighting while creating visual stories destined for theatrical exhibition and through my experiences working across different film production environments. I soon realised however that I would need to develop into new areas of practice to address adequately my research questions. Working exclusively as a cinematographer, I relied on being hired or approached for suitable productions and found during my first year of research that it was not always possible to impose my research agenda on these collaborative projects. Animated by problems of authorship, logistics and the creative scope of my proposed research, I began to branch away from collaborative fiction films and experiment with individual projects that could be more research-driven in their engagement with lighting. As such my research methods have drawn upon a wide range of artistic disciplines that offer understandings of mediated light in practice.

Initially my experimental practice takes inspiration from a lineage of video art such as a playful critique of broadcast across David Hall's *7 TV Pieces* (1971) which visually

disturbs the stream of images on a television channel or the reflexive intervention of using video feedback to create an infinitely reflected image of display equipment in Stephen Partridge's *Monitor* (1974). The subversive approaches to the functionality and technology of audio-visual content found amongst early video artworks have influenced significantly my investigative process. Nam June-Paik is a prominent figure in this field and perhaps one of the most important video pioneers. His installations *Zen for TV* (1963) and *Magnet TV* (1965) both exploit the magnetism of cathode ray tube television sets in an iconic demonstration of the plasticity of video that shapes new forms by directly manipulating the light of an image at the point of exhibition. More recently, Mark Lewis's artwork, which I will discuss further in the chapter of this thesis entitled *Sculpting Light* (p.100), continues this experimental tradition by using digital technologies to recreate and transpose imagery between live-action and virtual environments creating uncanny, surreal camera movements that again foreground the malleability of light in digital video.

My experimental practice also exists in dialogue with the tradition of expanded cinema which I will explain in more detail in the section of this thesis entitled *Sculpting Light* (p.107). In brief, this approach to the exhibition of moving imagery was pioneered by artists involved with the London Filmmakers Co-op in the 1960s, many of whom became well known for their structural-materialist ideas. Expanded cinema works of this era often emphasize awareness of the components that construct a cinematic experience rather than engaging in representational imagery as evidenced by the strobing repetitive colour loops of Paul Sharits' *Shutter Interface* (1975), which orchestrates four 16mm projectors to create rainbow imagery, or Liz

Rhodes' *Light Music* (1975), an immersive twin projector installation that transforms strips of light imprinted on celluloid into sound. Anthony McCall's *Line Describing a Cone* (1971) is a key example for this research as the artist attempts to transform cinematic projection into sculpture, filling his exhibition space with a dense artificial haze to give form to shafts of light emitted from a projector and in so doing inviting an audience to turn their back on the screen. This expanded approach to cinema, the notion of reconfiguring relationships between viewer and screen along with the exploration of video malleability present a vibrant artistic context that my practical experiments draw upon and further.

The rich history of light in painting, which is steeped in centuries of experimentation, has been another major influence on the practical methods employed for this research enquiry, particularly in relation to my collaborative cinematography endeavours. Notable chiaroscuro works depicting dynamic contrast such as Michelangelo Caravaggio's *Calling of St. Matthew* (1599-1600) or Georges de La Tour's *Joseph the Carpenter* (1642), through to softer depictions of light in Johannes Vermeer's *The Milkmaid* (1658) or the golden hour sun of Joseph Mallord William Turner's *The Scarlet Sunset* (1830-40) have influenced my work both aesthetically and in relation to the processes employed. These paintings, in particular, have been a recurring point of reference for me in discussions with directors, helping communicate an intended aesthetic and provide stylistic inspiration to establish the feel of a film.

Although a full investigation into painting is beyond the scope of this thesis, it is important to note that these practitioners worked closely with light and were continually innovating their techniques toward goals similar to some contemporary cinematographers. For example, Rembrandt van Rijn's *Night Watch* (1642) demonstrates this approach toward the mediation of light as the painter is known to have mixed charcoal and ivory into shades of black on top of an underpaint that incorporated crushed glass ensuring that, once hung, the surface would glisten slightly in ambient light and create an impression of richer shadows. Such an approach might be compared to push processing film stock, where the negative is rated at a higher sensitivity and developed longer than the manufacturer's recommended specification. This is frequently seen in the cinematography of Harris Savides to achieve images with increased contrast. During the production of *The Yards* (2000) and *Birth* (2004), Savides combined this technique with the use of muslin diffusion on light sources to create delicately soft illumination and rich shadows in the resulting imagery.

Cinematographers have drawn widely upon such painterly imagery as demonstrated by Nestor Almendros, who became known for his use of mirrors to create naturalistic lighting that relies heavily on daylight - *Days of Heaven* (1978) for instance recalls the stark light of Edward Hopper's *House by the Railroad* (1925) or *Rooms by the Sea* (1951), which depict long shadows and rays of illumination in the ebb of the day. Similarly, the metaphorical use of light in Joseph Wright of Derby's *A Philosopher Lecturing on the Orrery* (1766) and *An Experiment on a Bird in an Air Pump* (1768), both of which visually associate light with knowledge through their staging and



strong directional sources, can also be glimpsed in Sven Nyqvist's film *Persona* (1966). Throughout this production Nyqvist employed separate light sources, engulfing the two lead characters in different pools of light to emphasise visually a failure of communication between them that was central to the film's narrative.

It is clear then that cinematography continues an interest in the orchestration and investigation of mediated light found in painting and across a range of visual art disciplines. Sean Cubitt outlines this tradition of visual fascination with light in the introduction to *The Practice of Light* (2014) his comprehensive account of the subject area which is worth quoting at length here:

The effervescent superfluity of light is one of the entropic instances to which we seek to bring order: our infantile, oceanic immersion in the dazzling flash of moonbeams over rippled water, the flicker of dappled sunlight under trees, the night speckled with stars, the fall of firelight over skin. Control over light, and its mediations through visual technologies, matters because it alters the constitutive grounds of sensing, knowing and relating to one another and to the world. (2014, p.11)

## 2.2. Interpretivist Approach

To paraphrase Tim Ingold (2013), this is not a study *of* cinematography to learn *about* it but instead a study *with* cinematography technology to learn *from* it. He suggests that viewing the world as a confluence of materials with the potential to be worked can bridge a gap between image and object inherent in hylomorphic models of inquiry. Ingold terms these material-oriented processes of creation "correspondences" which is a key term that I elaborate upon in *Light and/as Material* (p.74) and employ repeatedly throughout this thesis. Ingold's interest lies in

understanding the process of “making” across cultures, and he was dealing with the differentiation between anthropology and ethnography in the writing I’ve drawn upon here. However, as I argue in the chapter entitled *Light and/as Material* (pp.45-77), my perspective situates light as a “material” of moving image production, and so this research enquiry attempts to understand creative cinematography by studying with and investigating the camera and lighting processes through which the discipline is conducted.

Hence this research uses an interpretivist approach whereby I develop understandings of lighting through my personal experiences tackling specific challenges during practical work. Hilary Collins (2010) summaries this epistemology as one that eschews universal truths, aiming to understand knowledge through our experience of the world where the meaning-making process reflects an interaction between qualities of our culture and the identified phenomenon. As Collins (2010, p.92) highlights, this perspective is “based on phenomenological psychology” because “it appreciates how each person’s perception of the same experience is unique and that they determine individual expectation, attitudes, actions and reactions towards others”. The interpretivist paradigm is well suited to this research as it embraces direct reports from my perspective as a practicing cinematographer and artist. As emphasised by Donald Schön (1983), this first-hand involvement is integral to the reflection-in-action necessary in discussing practical forms of knowledge such as creative acts of lighting in moving image practices.

The value of research enquiries in this vein is outlined by Andreas Fickers and Annie Van Den Oever in the concluding section of *Techne & Technology* (2014) their edited collection on cinema and media technology studies. They argue that attentive first-hand investigation - the sort encouraged by Schön - is required to understand correctly the impact of blurring media technologies such as, in this instance, changing lighting paradigms. They suggest that:

The re-sensitization of expert observers is needed to construct the epistemic object; to define what a “medium” is; and to create consensus in the field with regard to it... Providing a workable definition of its object is nevertheless crucial to any field of studies and perhaps even more so for the field of media studies as it aims at understanding cultural practices which constantly and rapidly change... inevitably conceal[ing] the traces media technologies initially create in users in terms of sense responses and awareness. (2014, p.274)

Fickers and Van Den Oever’s notion of “experimental media archaeology”, a line of enquiry inspired by Jussi Parikka and Erkki Huhtamo’s (2011) writing on the significance of anachronistic readings across media, is an important methodological reference for this research enquiry. As noted by Parikka (2012) in another text heralding the emergence of media archaeological discourse, these approaches allow us to see early optical devices and instruments like the panorama, diorama, zoëtropé, magic lantern and stereoscope with a fresh perspective as opposed to considering them as mere footnotes in the advent of cinematography. This perspective gives theoretical attention to relations between so-called ‘old’ and ‘new’ media, emphasising the power of what would typically be considered outmoded or obsolete media to reveal and inform current cultural practices. Taking these notions further, Fickers and Van Den Oever (2014, p.275) highlight the power of “tinkering” or “opening the black boxes” to suggest that active engagement with diverse forms

of media enables scholars to close an epistemological gap between linguistic and sensual ways of understanding media. Following this, the practical methods that I've outlined are necessary to understand material implications of this research enquiry and to investigate shifting technological relations implicit in creative lighting work.

Moreover, the progress between each practical experimental project and across my cinematographic work, as detailed in the accompanying portfolio, represents a developing understanding of mediated light in practice. As I've suggested, my experimental projects were a series of targeted learning enquiries, which enabled me to address the identified research problems specifically through first-hand investigation and hence these endeavours took inspiration from contextual academic writing as well as my prior collaborative cinematographic practice. In turn, the continuation of this collaborative practice necessarily found inspiration in the aforementioned experimental work as my understanding of lighting changed, developed and was informed by each project. This intersection of methods demonstrates Henk Borgdorff's (2012) suggestion that practitioner research should be considered as "imminent" rather than fixed – that the process is one of exploration as opposed to following a rigid path due to the often unpredictable actions inherent in creative practices. The accompanying diagram – Figure 1 - depicts this interaction, overviewing what will be described in *Light and/as Material* as a "diffractive" or cross-understanding present in this research enquiry, including the writing/presentation as an integral method.

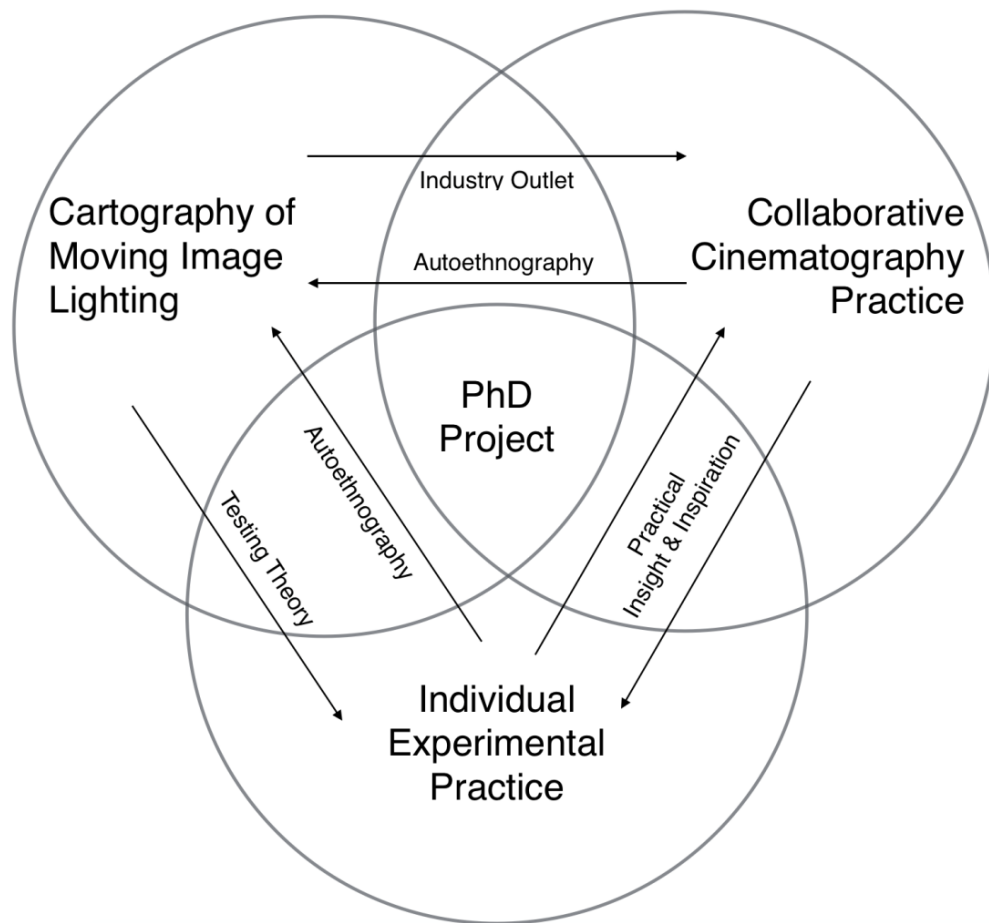


Figure 1. Interacting research activities.

## 2.2. Personal Knowledge

The collection of autoethnographic notation has been a principal evidence-gathering method of my research. This evidence primarily took the form of voice recordings made at regular intervals during the production of numerous narrative film and experimental installation projects. These recordings attempted to capture practical insight and creative challenges that I experienced when working with light during each project, drawing upon an anthropological mode of analysis known as “thick description”. Clifford Geertz (1993) popularised this method during his investigation of cultural symbols and argued that extensive detail about the research environment

is required to capture the context surrounding the behaviour of ethnographic subjects. As highlighted by Margot Duncan (2004), ensuring that such accounts are scholarly, justifiable interpretations rather than personal opinion necessitates the use of multiple sources of evidence to provide data that can confirm and triangulate my findings. As such, selected projects have been presented in an accompanying portfolio of practice which incorporates supplementary material such as: lighting diagrams, working sketches and photographic documentation, to represent further my production processes. Carolyn Ellis (2004) argues that the meaning of events in autoethnography becomes evident only in their narrative expression, emphasising the importance of constructing the story as close to the experience as can be remembered. Illustrative sections derived from my autoethnographic notes have been developed into short expressive narrative accounts which are interspersed with conceptual discussion throughout this thesis.

I've taken this narrative approach in the presentation of my autoethnographic evidence not only because lighting, to the cinematographer, is often rooted in a larger storytelling endeavour but also because this mode of address is well suited to discussing process. As I've suggested, the relations between a practitioner's conceptual lighting intentions and the resulting physically lit set, or location can be thought of as processes of correspondence which involves personal or "tacit knowledge" in Michael Polanyi's (2009) terms.

Taking this further, Ingold (2013, p.110) argues we can tell (discuss and share) the personal knowledge that grows through practical experience because telling is "not

to explicate the world... it is rather to trace a path that others can follow". He goes on to argue that personal knowledge and creative practice share the quality of motion, they are entwined movements which look forward to a continuous correspondence with materials. Narrative, Ingold suggests, can allow practitioners to share these movements whilst feeling their way forward along the path – forging accounts that in themselves open up possibilities *from* the creative process, encouraging a reader to investigate rather than shutting off such potential by specifying detached details *about* the creative process. In weaving such narratives into this thesis, I've attempted to convey specific aspects of lighting whilst retaining the uniqueness of each experience. Hannula et al. defend the importance of this endeavour:

Writing is simultaneously thinking and doing, both observing the world and creating it... writing itself is one of the forms in which reality is created. Writing as a way of thinking, doing research and reporting it, has to find a way of treating language in the pluralist manner so that the uniqueness of artistic experience is not lost when our thinking about it is communicated!  
(2005, p.37)

Pursuing a similar line of thought, Katy Macleod and Lin Holdridge argue for a creative use of writing in practice-research. They also suggest creative writing could be used to offer insight into working processes, revealing what it is like to think as a practitioner and presenting the possibility for new thoughts or speculations to arise between text and reader. Macleod and Holdridge (2011, p.354) suggest that such writing tends to exhibit a "highly reflexive tension between author and context", stressing the importance of foregrounding personal experience while situating one's research amongst relevant literature and practice. Thomas Schwandt (1994) argues similarly, stating that a form of heightened awareness and educated perception is

required during self-reflection, that attention to nuance and multiple dimensions come from intimate familiarity with the phenomenon being examined. As such, I have attempted to make the narrative passages that are presented here evocative and descriptively rich, in order to provide evidence for the ways that I'm working light through acute consideration conveyed in as much detail as possible within the space of this thesis.

### **2.3. Layered Writing**

As indicated, the autoethnographic narrative passages that document my practical work are interspersed within this written thesis alongside critical discourse. These sections are used to illustrate and further the theoretical argumentation put forward in each chapter and hence serve to incorporate embodied forms of understanding into the written component of this doctoral study, such as the "tacit" or "personal" knowledge that I've previously discussed. This approach, often described in ethnography as a "layered account" takes its cue from Carol Rambo Ronai's deeply personal work which uses introspective reflection to break free of conventional academic forms of writing. According to Ronai (1995, p.396), the layered account is a "narrative form designed to loosely represent to, as well as produce for, the reader, a continuous dialectic of experience, emerging from the multitude of reflective voices that simultaneously produce and interpret a text." Ronai argues that the descriptive flexibility and personal perspective embraced in layered accounts can make different "ways of knowing" available to the reader, therefore making this an



effective way of capturing or bridging the distinct practical and theoretical understandings implicit in this research enquiry.

Another advantage of using this approach for the written thesis is that it enables the text to capture and represent a sense of the journey and the multiple strands of enquiry that are required in practice-research. For example, an associated method which I've borrowed directly from Ronai is the use of the triple asterisk to denote a change of register between the different forms of writing in this thesis. Clear signposting in this way affords creative potential in my arrangement of the writing whilst ensuring the reader remains oriented. Providing this short pause or acknowledgement between each section enables the reader to understand and absorb the various perspectives on offer which, through their shifting back and forth, mimic the process of practice-research. In a similar manner, Ellis (2014, p.335) highlights the ability of creative writing to represent lived experience, arguing that: "I think and gather information like an ethnographer, but I try to write like a novelist or storyteller... These strategies allow me to show rather than to tell, present a feeling for how life flows and present the autoethnographic process". Hence, through the imposition of different forms of writing between one another, this thesis reflects the division of my time during the research enquiry, which has been split between practical engagement in film production and lighting processes just as much as searching through, reading and analysing texts.

## 2.4. Audience Engagement and Feedback

Given the correlation to vision, it would not be possible to address light (or creative lighting processes) without considering issues of the audience's perception and reception to some extent. For this research enquiry, such consideration is caught amidst a system that Gabriel Menotti Gonring (2011) terms the "cinematographic circuit". He suggests that the image is brought into being by a series of confluent, public operations, arguing that to watch is itself a mode of operating moving images or a sociotechnical process defined by culture and history – an area that is further discussed in the chapter entitled *Technologies of Light* (pp.120-180). Taking this into account, my approach to audience engagement does not consider reception in order to define interactions between a spectator and the work (as this involves a range of factors not dependent on lighting) but rather operates within the established exhibition frameworks that Gonring discusses and uses audience feedback as method to further my personal knowledge developed during creative processes. Thus, audience consideration in this research enquiry functions to open up new directions for learning from practical and creative uses of lighting rather than collecting data about the exhibition of resulting practical outputs.

Several methods have been employed to elicit audience commentary on practical work, and these have occurred at intermittent stages throughout my creative process. As Hazel Smith and Roger Dean (2009) suggest in their discussion of practice-led research outputs, unlike the scientific model, peer review is only the first stage of evaluation as the creative work produced enters public circulation and is often

part of a more extensive, iterative creative process. As such, during the production of practical projects I've engaged in critical discussion with my peers by screening or exhibiting work in progress. These peer groups varied from familiar local communities of researchers and practitioners such as the Bristol Experimental and Expanded Film (BEEF) collective or fellow students within the 3d3 Centre for Doctoral Training to broader, unfamiliar public arenas like academic conferences. During these experiences I've made notation, either in written form or through audio recordings, to solidify the feedback and allow for further reflection, which has subsequently guided the direction of my creative processes, helping me to develop outcomes for each practical project.

Upon completion of each project and the realisation of its output, I have sought further feedback and audience engagement by exhibiting in galleries/cinemas, typically through participation in public events such as film festivals or group art shows. Through attending these events, I have been able to engage with and record the response of audiences that are less familiar with my work which again provides an opportunity for further reflection on my creative process. In similar ways to Ingold's (2013) writing on the continuous nature of practitioner research, Smith and Dean (2009) support this contention with their description of a process-driven approach which argues that audience engagement should not be seen as a summative point in the research but instead incorporated into a cyclical framework that allows new potentialities to emerge within the practice. In short, at each stage of this research, I have ventured to expose my practical work to communities that are both familiar and unaccustomed to my field of study to capture feedback that

provides an opportunity to further develop my working processes through critical self-reflection.

### Chapter 3: Light and/as Material

This chapter arises in response to the notion of “lighting on screen” in Maurice Merleau-Ponty’s philosophical writing on perception. Prior to undertaking this research I had developed an intuitive understanding (or praxis/know how) of light during my practical, collaborative work as a cinematographer, which felt at odds with the highly technical perspectives presented in textbooks on the subject. Like many artists, I was keen to investigate the processes underpinning my practice so started reading wider theoretical work on perception, hoping to broaden my knowledge of the ways in which moving images “work”. This activity led me to this particular text. Merleau-Ponty (2002, p.361) briefly outlines his experience as a film viewer and specifically details how he considers light to behave differently when it is seen on screen as opposed to normal apprehension of the world. This reading ignited my interest to investigate further phenomenological approaches and understand exactly how the process that he terms “localisation”, during which the immaterial force of light becomes materialised on a projection surface, occurs. Merleau-Ponty’s writing was significant to me in its recognition of light as a variable, potentially malleable factor. This notion corresponded to the practical work I was conducting involving the orchestration and utilisation of different qualities of light to evoke a mood or convey narrative. As discussed in the chapter of this thesis entitled *Sculpting Light* (pp.77-120), the cinematographer is traditionally studied in relation to these aesthetic lighting decisions during moving image production but the role also has responsibility for the overall imaging process from capture to display and hence this notion of a “localisation” of light seems to be at the heart of the discipline.

To develop this concept, this chapter introduces lighting in moving imagery, which is the main focus of this thesis, by reconciling theoretical considerations toward the nature of light with my personal experience working with and conducting lighting during the production of moving imagery. It begins by outlining some of the ways in which artists work with illumination in their creative endeavours, going on to discuss the problem of materiality specifically for moving imagery and outlining the tradition of representation and a Cartesian divide, which many studies of materiality react to or oppose. The chapter indicates how stepping away from Enlightenment notions that equate light to knowledge enables a relation-based, performative consideration of materiality. In so doing, this perspective frees light to be part of a complex ever changing and generative entanglements of materials, rather than being considered a neutral illumination. The chapter concludes by applying these ideas to lighting in moving image production to situate this discipline as an Ingoldian “correspondence” with materials and aims to show the cinematographer as someone who works with and through light, following its flow akin to practices that are perhaps more widely recognised for their material implementation such as pottery, basket weaving or glass blowing.

### **3.1. Experiencing Light**

*It's a balmy early summer's morning. I'm up at the crack of dawn to make the commute over to Cheltenham for a class I'm giving on experimental film. After the usual morning routine, I stroll into the narrow galley kitchen for a glass of water, and as I turn the tap*

*releasing a cascade of liquid into my glass, I catch a glimpse of another cascade in the corner of my eye. Brilliant sunlight gushes through a tall sash window at the end of the room striking the large murky white wall that runs the length of the kitchen. This incident light arrests my attention, I set my glass aside and study the features of the effect. Dappled, soft leaf shapes dance across a luminous rectangle that elicits a vivid presence in the room. A quiet stream of water still impacting on the metal sink behind me animates the light, providing a calming atmosphere that seems to personify the smooth motion of the branches swaying outside.*

*The sun is momentarily obscured by a cloud causing the leaf shadows to lose their definition, the projected rectangle fades and becomes a ghostly dim outline of its former presence. Shaped gradients closer in luminance to one another spread across the wall, and the movement is dulled down as individual shadows are merged into a larger whole. As the sun emerges again the room brightens, and the effect is once again reinforced, shimmering leaves seem to celebrate their new life and move more vigorously between their shadowed boundaries. Bright curved streaks of sharp, direct light dissect this pattern and march to their own beat, swaying much slower than the effervescent arrangement that spreads across the window's outline. Tiny imperfections in the paint that adorns the wall and contours of the underlying brickwork are made visible as harsh light casts precise shadows that reveal such dimples of surface and variations in texture.*

*As this ebb and flow of illumination play out across the wall I realise I'm watching a unique occurrence - this particular light on this particular day with this arrangement of tree and wind will not succumb to repetition however intricately one attempts to recreate the circumstances. I grab my phone, shut off the tap and begin to capture the effect in an*

*attempt to secure something for future reference, posterity and perhaps to document my  
realisation.<sup>6</sup>*

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Henry Plummer (1987) argues that light has an ability to enliven surfaces in a dialogue or vibrant exchange between the material and immaterial. He contends that such occurrences are not dependent on the quantity of light falling upon a surface but rather a particular quality of light encountering a particularly responsive configuration of matter, which results in a stimulating effect on our senses. For Plummer, this animate sensation, or bringing to life of material, is linked to an inherent understanding of light as a force that dictates the circadian rhythms regulating our bodies and the world we inhabit. We associate light with the tangible life-giving processes of energy transferred from the sun through inorganic and organic matter as well as numerous instances emitted from natural phenomena such as lightning or explosions in which incandescent illumination indicates volatile energy. Plummer goes on to suggest that the visual vitality of these particular exchanges between light and material are rooted in an ability to confirm our sense of being. By placing us in an environment that appears alive and imbued with energy, attention is called to our physicality within the environment, and so the light-material exchange bestows us with the feeling of being involved or engaged with the world - resulting in a spiritual, transcendental or wondrous feeling.

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<sup>6</sup> Reflection on capturing the first diacritic iPhone shots in Bristol, October 2014.



This potent emotional and physiological capacity has interested numerous artists over the centuries whose work has foregrounded qualities of illumination while making use of the medium of light as a principal agent in their work. Laszlo Moholy-Nagy's *Light Modulator* (1922-30), a tabletop device comprised of numerous rotating and intersecting planes of metal or glass, casts continually morphing shadows across its surroundings revealing the intricate endless variations of light. The *Light Modulator* manufactures these instances of the vibrant exchange between light and material Plummer so eloquently describes; surfaces gleam, sparkle and refract as direct illumination strikes the modulator while the animated shadows projected around the room engulf the viewer eliciting a sense of mysterious awe.

More recent technologies have enabled artists to create increasingly grandiose statements with light, such as Olafur Eliasson's renowned *Weather Project* (2003) for which he employed hundreds of mono-frequency lamps to create a large hanging sun-like orb in the Turbine Hall at Tate Modern. Light emitted from these lamps was restricted to specific wavelengths causing the room to be burnished in an orange-yellow glow that eradicated all other colour sensations around the installation; at the same time, a thin veil of artificial mist pumped into the environment caused occasional water vapour formations akin to clouds. Drawn to the light like moths, visitors would often lie directly below the sizeable incandescent source, bathing in its uniform rays and enjoying the enriching sensation of a constantly setting sun, driven by and performing the physiological connection between light and energy that Plummer situates at the heart of luminous matter.

Rather than mimicking or eliciting its effects, other artists have sculpted naturally occurring light directly as a feature of their work. Perhaps the most eminent of these so-called 'light artists' is James Turrell whose 'Skyspace' series consists of well-orchestrated chambers that feature ceiling apertures. *Deer Shelter* (2006) is one such chamber that, situated in Yorkshire Sculpture Park, is designed to elicit meditative contemplation and reverie through its selectively framed portion of the sky. Firm diagonal benches encompass the small room, directing a visitor's gaze upward toward the exposed view, while a strip of soft illumination emanates from just above the benches to produce a smooth gradient across the whitewashed walls and ceiling that surrounds the overhead aperture. Natural rhythms and moments of light become a focus of this work as worldly illumination is juxtaposed by a surreal and heavily framed setting. Turrell's work is often said to elicit psychedelic effects due to these unusual contrasts that at once heighten natural instances of light but also isolate the viewer placing her or him in a contemplative space that shows how occurrences of light can be seen to evidence Plummer's arguments about the feelings of awe that luminous matter evokes.

Within architectural discourse, numerous other writers support a transcendental consideration of such encounters between light and material. Mark Majorm, Jonathan Speirs and Anthony Tischhauser (2005) recognise that our visual sense revolves around the interplay between light and surface, highlighting this as a crucial element in the design of structures. Although less poetically inclined than Plummer, they uphold that the potential to impact mood or evoke emotions within built environments is fundamentally dependent on the interaction between light and

space through this illuminative power to reveal surface shape, texture or colour and hence define form:

If the shape of our three-dimensional world is determined through form, we experience its nature through surface. It is the very edge of matter, the interface with space. Surface 'clothes form' and in so doing provides essential visual information about the very nature of materiality. (2005, p.83)

Emphasising the experiential nature of such occurrences, the authors argue that it is through an interplay of light and surface that we understand materiality. Although not explicitly, their argument follows Plummer in suggesting that such exchanges between light and material can serve to root us in the world and confirm a sense of being.

Giving a more scientific perspective than the authors already discussed, Peter Boyce seeks to understand the relationship between environmental lighting and human perception. Boyce (2003, p.220) writes: "the luminous environment is the starting point of perception and lighting can be used to change the luminous environment... There is clear evidence that by changing the lighting, the perception of objects can be changed from drab and boring to eye-catching and dramatic." Boyce is concerned more about the functionality of light rather than its expressive qualities. However, he reaches a conclusion that paves the way for further interpretations to address its potentially emotive impact and to take these insights further. Boyce stresses the role that the prior experience and knowledge of an observer plays in what is known as the high-order perception of objects when internal cognitive faculties screen external sensory input to filter stimuli that would be unimportant to the observer. He suggests that although properties such as form, texture, colour and reflection play

a significant role in the perception of an object, changes to lighting have significant power over this perception precisely because of light's interaction with and effect on these other factors.

Due to the functioning of our visual system and instinctual associations between illumination, energy and life, it is clear that interactions of light and material can stir emotional, affirming responses in a viewer, as discussed in Plummer's evocatively thick-textured descriptive writing. The aforementioned artworks show that light art conjures such responses in a relatively simple fashion through live encounters between audiences and the orchestration of light and materials. However, there are of course mediated practices that exploit creative orchestrations of light in a similarly evocative manner but with recording mechanisms or materials employed to enable the capture and subsequent display of such occurrences. Henri Alekan (1991, p.14) pertinently outlines in relation to cinematography, perhaps the foremost practice of mediated light, that interactions of luminous matter and the subjective mystery surrounding them have become the bedrock for an intuitive language of visual communication. He posits: "Light allows us to 'see' and even more, it allows us to 'think', however, how are light and its opposite, that is to say darkness which is its starting point, experienced by man?". This experiential conundrum of mediated light is touched upon in Merleau-Ponty's (2002, p.361) aforementioned phenomenological account of perception. He observes that lighting and reflections become 'solidified', undergoing a transformation from immaterial to material when presented photographically so that their effect loses the ability to reveal objects and is confined to or 'localised' on the screen. He argues that: "vision merely takes up on

its own account and carries through the encompassing of the scene by those paths traced out for it by the lighting... We perceive in conformity with the light, as we think in conformity with other people in verbal communication". From this perspective, photographic lighting can be seen as the live orchestration of light and material to evoke an emotional response which then undergoes a process of materialisation to be presented to a viewer.

Dealing specifically with the moving image, Jean Pierre Geuens claims that lighting in this domain cues viewers towards particular aspects of the image and in so doing exploits the way we perceive objects as external to us but understood through our internal faculties and constructs. He writes that:

in film, light is never constant. Its nature rather is ephemeral, its character volatile. All sorts of adjustments keep breaking down the desired illusion for a stable reality. As each successive shot (close-ups, etc.) modulates the master shot's original lighting setup, transcendental aspirations for a solid world vanish under the weight of vital accommodations. (2000, p.157)

Analysing the process of a typical production, he highlights here the processual nature of orchestrating light. He goes on to suggest that mood fundamentally resides outside the individual so that we inhabit 'environments' of mood - recognising an intrinsic connection between external stimuli and emotion. In most films, Geuens argues, the mood created for an audience through lighting mimics that which all of the characters are experiencing. He suggests that this reliance on cinematic convention and the simple illustration of a narrative is depriving viewers of any experience of the other (encounters with existence), which is how we necessarily view the world on a daily basis. According to this line of thought, lighting must break free from convention to offer viewing experiences that challenge and engage

audiences with new constructs (cues, signifiers etc.) through which they can view filmic worlds.

Drawing extensively on the philosophy of Martin Heidegger, Geuens' argument seems primarily concerned with the possibility of achieving a state of transcendence during moving image reception. He suggests that because all manipulation of film lighting relies on ontic sources, it can never truly reveal the condition in which it works. This discussion hinges around the prospect of stepping outside ourselves to understand the true essence of being, about which Heidegger (2000, p.95) wrote: "In the midst of beings as a whole an open place occurs. There is a clearing, a lighting... Only this clearing grants and guarantees to us humans a passage to those beings that we ourselves are not, and access to the being that we ourselves are". Hence, through Geuens we recognise a consideration of lighting not through aesthetic or technical concerns but rather a more transcendental, ontological approach. Specifically this notion of 'Lichtung' (which varies in Heidegger's uses but is roughly the 'clearing' described above - or the condition in which all light functions) that appears pivotal to the power of moving images for Geuens. Using the example of Bill Viola's *I Do Not Know What It Is I Am Like* (1986) and Alexander Sokurov's *The Second Circle* (1990), Geuens argues that when entities appear on screen as neither film characters nor real world inhabitants another realm of experience is exposed which can offer the audience a glimpse of the 'Lichtung'. This theory purports that the 'Lichtung' is a transcendent force within which all instances of light occur – or, in accordance with Plummer's arguments, perhaps an immaterial environment fundamentally beyond the material interactions that stimulate our visual perception.

This notion of otherness and the 'clearing' is not unique to Heidegger. The Japanese concept 'Ma' is closely related to his writing on the topic, suggesting a deeper structure underlying our understanding of light and space. Derrick de Kerckhove (1997, pp.165-166) offers a pertinent summary of 'Ma' in Western terms, quoting Michel Random:

Ma is the Japanese word for space or 'space-time', but it does not correspond to our idea of space. The main difference is that when we say space we imply room or empty areas. To the Japanese, Ma connotes the complex network or relationships between people and objects... 'In a word, Ma is perceived behind everything as an undefinable musical chord, a sense of the precise interval eliciting the fullest and finest resonance.'

As suggested here, 'Ma' may be seen as a connecting force between entities, giving agency to both animate and inanimate objects in a similar fashion to the way Plummer described vibrant exchanges of luminous matter. Junichiro Tanizaki's (1991) writing on the use of light in architecture provides strong evidence of the principles of 'Ma' in action through his suggested identity of Japanese design. He recognises "differences of national character" (1991, p.19) in the use of lighting in moving images, though this seems an illustrative point in his more comprehensive argument that is not explicitly developed. We can understand from these arguments that 'Ma' and the 'Lichtung' then present a possible understanding of lighting as something that cannot be 'seen' nor 'thought' in Alekan's terms but instead works as an underlying structure in our relationship with the world, which can stir profound emotional and existential encounters.

### 3.2. Moving Image Materiality

Having discussed the ways in which an individual might experience lighting, and developing Merleau-Ponty's argument, this section will explore how the potentially emotive, existential power of this underlying structure of lighting is harnessed and conveyed for an audience during moving image production through material interactions which "localise" light on the screen. Such "localisation" involves a cinematographic process beginning with an idea, continuing through the exposure of an image during production and resulting in the apprehension of a projection or display of the resulting image. To understand the material interactions involved in this process, however, a more detailed explication of the notion of materiality in relation to moving imagery is necessary. As Daniel Miller (2005, p.4) highlights in his edited collection on this topic, the term materiality, in colloquial use, tends to refer simply to quantities of objects (or artefacts) and hence does not explain a great deal because "this definition soon breaks down as we move on to consider the large compass of materiality, the ephemeral, the imaginary, the biological, and the theoretical; all that which would have been external to the simple definition of an artefact". More specifically, while discussing the various ways that time can manifest itself in and on film, Bernd Herzogenarth's (2015, p.9) summarises the necessity of the tradition of materialism in moving image studies and is worth quoting at length:

Material culture is based on the premise that the materiality of objects is an integrative part and parcel of culture, that the material dimension is as fundamentally important in the understanding of culture as language or social relations - but material culture mainly focuses on the materiality of everyday objects and their representation in the media (literature, film, arts, etc.). Thus, a further and important step would be to redirect such an analysis to the materiality of the media itself, to put the probing finger not only at the thing in representation, but also at the thing of representation.



Herzogenarth highlights an important distinction here between the materiality of objects as represented in moving imagery and the materiality of the medium itself, that affords such representations and in so doing calls into question the physical nature of media. Through an examination of the compositional properties and physical functionality of equipment involved in the creation of moving imagery in the way suggested above, Herzogenarth argues that it is possible to acknowledge the interdependence of both cultural and natural factors to extend the understanding of a “medium”. He suggests that during an era where divisions between nature and culture are becoming more eroded, the concept of “matter as media” can help to broaden the discourse in cultural and media studies toward an inclusive “media ecology” perspective, which not only addresses increasing *intermedality* but “also allows matter, the materiality of media, its place in that *inter*, in that ecology.” (2015, p.6)

Such studies of the materiality of moving imagery have become much more widespread in recent years, particularly in response to the rise of digital technology. Laura Marks’ (2002) writing is a good example of this, in which she traces the physical action of electrons through various moving image capture and display processes to explore the materiality of digital imagery. She argues that “electronic images, like all of us, owe their material being to electrons and their associated waveforms. We are physically implicated in the virtual realms we inhabit, and far from divorcing ourselves from the world when we enter electronic spaces, we are more connected than we may imagine” (2002, p.174). While Marks differentiates analogue from

digital in her observation that digital circuits only respond to behaviour of the masses of electrons, ignoring weaker signals and causing the wave-particle relationship to be overridden, she ultimately argues for the material basis of the digital moving image as enfolded in the interconnected mass of electrons through which it is transmitted along common waves. Marks' emphasis on the atomic structures that constitute moving imagery in this physical sense demonstrates the potential for a material-centric perspective to further debates around digital processes.

Another materialist perspective can be found in the writing of Nicholas Chare and Liz Watkins (2013) who, in a similar way but addressing experimental celluloid moving imagery rather than digital, seek to break from what they perceive as an entrenched emphasis on representation and signification amongst film scholars by proposing an investigation into the organic substances (materials) that constitute analogue film stock and the "carnal" sensual effects these can create for an audience. Discussing Bill Morrison's *Decasia* (2001) and Peter Delput's *Lyrical Nitrate* (1990), both created through the reappropriation and editing of decomposed film, they suggest that "the footage now reveals a materiality, originally far less perceptible, concealed behind the ethereal, evanescent images that appeared on screen" (2013, p.75). In their argument against representation, for example, Chare and Watkins liken the rotting reels of *Decasia* (2002) to an "impaired skin" which they suggest bestows the film with a horrific feeling due to its abject quality. Through this, and other connotations around the material properties of these old nitrate films, Chare and Watkins seek to look beyond "symbolic language" toward a "materialist ontology" that identifies the importance of matter in film. These studies demonstrate that regardless of analogue

or digital means, materiality has become an essential and inescapable factor in understanding moving imagery and often arises in response to the dominance of representationalist ideas in film studies which efface the materiality of media.

A more developed approach to the consideration of materiality in relation to moving imagery can perhaps be glimpsed through Jussi Parikka's notion of "medianatures". Emphasising minerals, raw elements and seeking to re-trace a deeper timeline of matter in media, Parikka (2015, pp.4-5) suggests that Geology can be "a way to investigate materiality of the technological media world. It becomes a conceptual trajectory, a creative intervention to the cultural history of the contemporary... extending traditional notions of media materialism into a more environmental and ecological agenda." Rather than seeking to interrogate the complex functions of media as they are presented to the practitioner or viewer, Parikka shifts the debate here to a wider perspective, arguing instead for the necessary consideration of physical environmental influences on, and impacts of, media. He suggests that on one hand media, through processes of recording and reproducing, become a way of ordering and understanding our relationship with the earth, while conversely the earth itself provides and constitutes media in their physical makeup as "the affordances of its geophysical reality make technical media happen" (2015, p.13). Hence the notion of "medianatures" affords recognition of these entanglements. Parikka (2015, p.14) argues that specific depictions of such co-constituting materialities between media and nature are therefore also concerned with political issues such as "relations of power, economy and work".

This notion is predicated on Donna Haraway's writing about technobiopolitics in which she outlines a similar concept of "naturecultures" while narrating companion relationships between humans and dogs. Haraway (2003, p.8) uses this notion to get beyond "relations of significant otherness" such as "subjects, objects, kinds, races, species, genres, and genders" which she suggests are nothing more than "the products of their relating". Haraway argues that instead of these binary oppositions, the consideration of naturecultures means a more nuanced relationality in which everything is always already entangled. She offers a topological perspective of nature and culture which understands the world through a series of transformations where infinite material surfaces continuously morph to form or generate boundaries such as nature and culture rather than presupposing them as fundamental divisions.

Turning to Karan Barad's writing can build on this insight, as well as Herzogenarth's earlier suggestion of erosion between culture and nature. Barad offers a similar but more developed explication of the importance of matter, arguing against distinctions between nature and culture entirely in favour of a more radical understanding. Discussing the physicality of things, she suggests "the primary ontological unit is not independent objects with independently determinate boundaries and properties but rather what Bohr terms 'phenomena.'... *phenomena* are the *ontological* inseparability of agentially intra-acting components" (2007, p.33 original emphasis). Barad attempts to reframe existence in a way that eschews ingrained notions of separateness, representation and divisions between objects to instead see matter as active and generative of change or differences. In contrast to other perspectives on materiality, Barad proposes that matter not be read through *inter*-actions in which

separate physical forces create specific cause and effects upon one another (i.e. the chemical reaction of light striking a film negative causing the latent image to have a particular aesthetic effect) but rather as *intra*-actions that are relations from within matter “through which part of the world makes itself differentially intelligible to another part of the world and through which causal structures are stabilized and destabilized” (2007, p.140). An example of this would be how the moving image aesthetic differentiates the exposed negative from the unexposed negative. Barad (2007 p.135) uses this notion of *intra*-agency to shift debate “from questions of correspondence between descriptions and reality to matters of practices, doing and actions” and suggests that studying matter (or materiality) in the way proposed would be to study the enactment of boundaries during a constant production of difference.

As with Parikka, Haraway’s (2004) writing is of central importance to Barad’s ideas surrounding materiality and particularly the notion of a “diffractive” methodology. Barad (2007, p.24) suggests a diffractive approach is a counterpoint to common metaphors of reflection; “both are optical phenomena, but whereas reflection is about mirroring and sameness, diffraction attends to patterns of difference”. In this view, the notion of reflection emphasises and adheres to the separateness between phenomena that Barad argues against, but the metaphor of diffraction, on the other hand, is more suitable for addressing entanglements of ideas and materials as it entails an inherently generative perspective, seeking to explore the product of multiple phenomena which therefore enables an understanding of how such boundaries are produced rather than presuming them in advance. This can be traced

back to Haraway's (2004, p.70) writing on diffraction as a methodological metaphor which further explains the notion, suggesting that "diffraction is a mapping of interference, not of replication, reflection, or reproduction. A diffraction pattern does not map where differences appear, but rather maps where the effects of difference appear." As evidenced in Barad's discussion of wave-particle duality, seeking to understand or study phenomena "diffractively" is to accept multiplicity, to embrace and look for the differences that these multiplicities create in their "interference" or juxtaposition with one another. This approach is employed frequently in New Materialist writing, a recent school of thought arising from feminist theory, with which Barad and Haraway identify. In an online entry on this topic, seeking to open these esoteric terms to wider audiences as part of a European New Materialist research initiative, Evelien Geerts & Iris van der Tuin (2016) outline how studies in this field can contribute new understandings, suggesting "rather than employing a hierarchical methodology that would put different texts, theories, and strands of thought against one another, diffractively engaging with texts and intellectual traditions means that they are dialogically read 'through one another' to engender creative, and unexpected outcomes".

Although these examples share a post-representational perspective, it is clear that the materiality to which they have turned is far from an agreed approach - the New Materialist perspective seen in the writing of Barad and Haraway differs implicitly to materiality as employed in Marks (2002) and Chare and Watkins' (2013) writing for instance. The later writers emphasise the "sensuous" or "carnal" nature of substance, relating this to the affect of moving imagery for an individual viewer's

senses and highlighting the importance of sensory engagement in understanding matter. They seek to investigate moving imagery through haptic, sensory, engagement by examining the finite components that constitute systems of capture and display in relation to an individual's physical, tactile apprehension. Through Barad's perspective, however, the materiality of moving imagery might be understood with a diffractive lens, seeking to examine the patterns of difference that are generated by capture and display processes through divergent readings of them. Again this highlights the difference that Barad proposes between *inter*-actions and *intra*-actions with regards to matter - whether to approach this as relations from within phenomena or relations between distinct agents. Although drawing on the common influence of Haraway's writing, Parikka suggests another, somewhat Deleuzian, variation on the study of materiality, which revolves around the figure of the metallurgist as someone who follows a flow of materials and makes concrete forms (theories/depictions) from its endless potentialities. He argues that "there is a metallurgical way of conducting theoretical work: ambulant flows, transversal connections, and teasing out the materiality of matter in new places, in new assemblages of cultural life in contemporary technological media" (2015, p.23). It could be argued that despite such differences, an important similarity in these studies of materiality is their drive to look beyond boundaries between nature and culture (or technology/media and nature) toward more entangled notions which presuppose or underpin traditional conceptual and representational divides as will be discussed in more detail later in this chapter.

As these writers show, we could perhaps outline materiality in relation to moving imagery “diffractively” through an appeal to intra-actions, considering human senses and the haptic qualities of the medium in conjunction with an investigation of the geology of the medium. However, light, the primary focus of this thesis, is one factor that none of these, or other studies toward the materiality of moving imagery, consider in great detail. This disjuncture is perhaps because, as Barad (2007, p.29) discusses, the physical nature of light itself has been long contested whereby:

on the one hand, light seemed to behave like a wave, but under different experimental circumstances, light seemed to behave like a particle. Given these results, what can we conclude about the nature of light-is it a particle or a wave? Remarkably, it turns out that similar results are found for matter.

As discussed in *Sculpting Light*, lighting can be a powerful consideration for practitioners working with this medium and as such I will argue that light is materially implicated in the production of moving imagery just as much as the metal, plastic, glass, silicon and other substances involved in processes of capture and display. For instance, the particular minerals mined from the earth in the construction of camera sensors are sought for their light responsive and transmissive characteristics. The physical structure of celluloid and digital sensors are then engineered from these minerals to maximise the sensitivity to light across particular wavelengths. Projection theatres are lined with light absorbing fabrics to emphasise reflectively coated screens in an audience’s field of view. Specially refined glass funnels light into a camera and later emits it in the same dimensions during projection. Backlit liquid crystals in ubiquitous portable displays are physically coaxed between states to create an image. These material relations are just some of the ways in which, as Merleau-Ponty outlined, “light becomes localised on the surface of the screen”.



### 3.3. Optical Metaphor and Epistemology

It is perhaps unsurprising for Barad to employ optical terminology such as “reflection” and “diffraction” when outlining her theoretical approaches as light has long been considered epistemologically, with conceptual links to knowledge since the earliest recorded studies of vision. Euclid’s (1943) work on optics in c.300bc for instance, later developed by Claudius Ptolemy (1996) to introduce the concept of refraction in c.100ad, argued that the apprehension of objects is stimulated by visual rays extending out from the eye with a geometric approach that can be seen as the introduction of mathematics to the study of vision. Such early writing on vision was dominated by extramission theory (the notion that light rays emitted from the eye afford vision) and it was not until Ibn al-Haytham’s (1989) development in 1021 that understandings began to shift toward the notion of the eye receiving light. A subsequent series of debates took place during the Renaissance period to situate light as either a particle as per Isaac Newton’s (2010) investigations published in 1704, or a wave as suggested by René Descartes (1998) in 1637 and further embellished by Christiaan Huygens (2005) in 1690 which forged the grounds for contemporary assertions that light exhibits so-called wave-particle duality. Barad (2007, p.86) discusses the field of quantum optics that has emerged from these debates, highlighting the distinctive nature of this recent scientific work and suggesting that “whereas classical mechanics and geometrical optics are (nowadays understood to be) approximation schemes that are useful under some

circumstances, quantum mechanics and physical optics are understood to be formalisms that represent the full theory”.

Offering an in-depth history of understandings about the nature of light, A. Mark Smith (2015, p.415) outlines the long evolution of these ideas and their epistemological connotations as a movement from sight-oriented to light-oriented perspectives. Discussing the work of Johannes Kepler specifically, he suggests that by the late 17th century “the rupture between light theory and sight theory implicit in Kepler’s account of retinal imaging was now absolutely explicit, and Descartes was pivotal in making it so by locating it at the juncture between body and mind”. According to Smith, Descartes developed a mechanised approach to sense and perception in conjunction with his earlier theory of light and vision. As suggested above, Smith argues that this mechanisation inherited an “epistemic gap” between subject and object (body and mind) from Kepler’s work, which therefore formed the basis for the dualism associated with Cartesian philosophy. To situate the use of optical metaphors about knowledge as arising through this evolution of epistemic perspectives reinforces Barad’s notion of a “diffractive” methodology. As I’ve suggested, Barad’s writing attempts to eschew boundaries between subject and object to recognise the intricate entanglement of phenomena and her break from the typical optical metaphor of “reflection” is indicative of this epistemological shift.

The relationship between the nature of light, knowledge and vision is problematised further by Barbra Bolt’s writing about art practice. While discussing the difference between the harsh glare of Australia’s ubiquitous desert light and entrenched

European concepts of light, she draws upon Martin Jay's historical writing to outline traditional associations that are worth quoting at length here:

Light, understood as the perfect linear form that operates according to the laws of geometric rays, was defined as lumen. Lumen was seen to be the essence of lumination. In contrast, lux emphasized the actual experience of human sight... This dualistic concept of light as lumen and lux complemented the dual concept of vision. On one hand, vision was conceived as observation with the two eyes of the body; whilst on the other, as speculation with the eye of the mind. (2004, p.126)

Bolt argues against these typical relations between a dualist approach to vision and the nature of light, suggesting that the dazzling glare of Australian sun provokes a different understanding in which the work of art no longer sheds light *on* matter but rather sheds light *for* matter. Drawing on Heidegger's writing, Bolt (2004, p.123) argues that the notion of art as "unconcealment" (discussed further in *Technologies of Light* (pp.144-147)) is predicated on "Enlightenment metaphors" due to the way in which the "beneficence of light allows truth (alétheia) to be revealed." These metaphorical associations of light and revealing are also recognised by philosopher Hans Blumenberg (1993), who attempts to show how transformations of metaphor indicate changes in world-understanding and self-understanding, basing his discussion around metaphors of light for their expressive power and subtle capacity for change. He claims that the manipulation of light is the result of a long process so that what was once a homogeneous, presupposed medium of visibility affording neutral representation shifted in the nineteenth century to a localised factor which could be adjusted for an accentuating approach to vision. In the same way that Bolt uses Heidegger's notion of "unconcealment" to represent the revealing power of art,

Blumenberg argues that since the dawn of theatre, light has conceptually heralded the power to generate meaning because we presume dark to be the natural state.

The prevalence of this notion of light as a form-giving, generative force is outlined further in Arthur Zajonc's historical account of relations between light and mind. Zajonc introduces his subject by offering the example of a congenitally blind patient unable to recover their vision even after surgical treatment. He outlines how, although they might be physically capable of seeing, the patient cannot understand or process the newfound sense of vision because other cognitive capacities define their world and "give it substance and meaning" (1995, p.6). From this observation, Zajonc concludes that "besides an outer light and eye, sight requires an "inner light," one whose luminance compliments the familiar outer light and transforms raw sensation into meaningful perception. The light of the mind might flow into and marry with the light of nature to bring forth a world" (1995, p.6). Zajonc's discussion adheres firmly to a dualist perspective which Bolt would describe as equating light to form, knowledge and the subject as opposed to darkness which is equated with the irrational, to matter and the unknown. This idea is very similar to the way that Zajonc describes this relationship between an "outer" and "inner" light. Bolt's objective is similar to Barad's ideas discussed earlier in that she aims to go beyond this heliophilic Enlightenment notion of light and knowledge.

Instead of light revealing the truth of the world then, Bolt argues for an alternative perspective by drawing upon Paul Carter's "performative principle of *methexis*" (2004, p.125). Based on her landscape painting practice, Bolt outlines how the notion

of “glare” can develop this understanding of the relationship between light and matter. She argues that the dazzling superfluity of light experienced in the midday sun can be so intense that form becomes “fuzzy”, or “deterritorialized” in Deleuzian terminology and traditional rules of linear or aerial perspective are overwhelmed. She also describes the physical relationship between her body and the sun resulting in “pterygiums and sun beaten skin” occurring during her painting process to suggest that “light can no longer be postulated as the catalyst that joins objects whilst itself remaining unbent and unimplicated” (2004, p.131).

Arguing instead for a more performative perspective on knowledge, Bolt draws upon Aboriginal artwork which, she suggests, demonstrates how creative acts can be considered as generative rather than representational. Expanding upon this concept, she offers Carter’s notion of *methexis* (developed in discussion of such Aboriginal art practices) as a new way of understanding the world in which “meanings emerge in the facts of the matter. Rather than meaning being revealed or clarified” (2004, p.142). In so doing, she argues that knowledge is embedded and locally situated rather than represented. In other words, shifting to a *methektic* perspective, which Bolt suggests is demonstrated in Australian Aboriginal art prior to colonisation, entails an understanding of light that is materially implicated in the creative process: “Images no longer stand in for or signify concepts, ideas or things, nor are images signs that ceaselessly circulate... Imaging produces real material effects” (2004, p.142). Bolt steps away from Cartesian dualism by separating knowledge from the notion of light as a force which gives form to matter, to instead situate knowledge as

material relations, therefore opening the possibility for light itself to perhaps be considered a malleable substance, similar to matter, in this creative context.

There are strong parallels between Bolt's notion of *methexis* and Barad's notion of *intra-agency* that was touched upon earlier. As I've outlined, Barad uses *intra-agency* to shift the debate from what she critiques as a representationalist understanding of the world in which descriptions and reality are at odds with one another toward a more entangled perspective where boundaries are generated through the relations or interactions of matter. Bolt's writing draws upon a similar underlying world-view to this, though her attention is directed specifically toward art practices rather than Barad's more extensive metaphysical investigation. As Bolt argues, "to think *methektically* is to think quite differently about the potential of visual practices. It involves thinking through matter... In this view, visual art practice is not concerned with shedding light on the matter, but can be conceived of as the relations in and between matter" (2004, pp.147-148). From this, we can see that Bolt's notion *methexis* is akin to *intra-agency* in that it specifies a non-representational understanding in which matter itself is generative rather than having forms (or representations) imposed on it from a separate subject. Both writers also suggest that their perspective engenders a "performative" understanding of matter; for Barad (2007, p.49 original emphasis) this concept recognises that "knowing does not come from standing at a distance and representing but rather from *a direct material engagement with the world*"; however, for Bolt (2004, p.150), again original emphasis, a "productive materiality of performativity" means that "*matter is transformed in the exchange between objects, bodies and images.*" Although Bolt's

text precedes Barad's and these two writers arrive at their position through very different arguments, they do draw upon a common post-structural lineage of Deleuze and Foucault when outlining these corresponding ideas toward a performative understanding of materiality. Thus it can be argued that Bolt's writing applies a philosophy similar to Barad's but in the context of creative art practice rather than scientific investigation.

As argued previously, studies of materiality and moving imagery can be seen broadly as a reaction to or stance against representational perspectives that dominate the field. For example, Marks' (2002) attempt to define digital capture and display processes as materially constituted in the same way as older analogue forms, along with Chare and Watkins' (2013) suggestion that some meaning of film resides beneath its surface symbols in the material composition or decomposition of celluloid. In addition to this analysis, the previously discussed work of Parikka and Herzogenarh are perhaps both indicative of investigations into media which cast aside the representational entirely, seeking, in these instances, a wider perspective of deep time and an erosion of the boundaries between nature and culture toward an understanding that favours the raw materials implicit in production processes. The aforementioned performative understanding of materiality is well suited to this context and applying such a perspective to the study of lighting practices in moving image production might entail a new understanding of the creative discipline of cinematography. In an article addressing the relationship between New Materialism and media theory, Parikka "proposes a multiplicity of materialism" and suggests that "the matter of technical media is not only in their object-nature - even if that would

help us think beyond representation, signification, or a correlationist predisposition” (2012, pp.98-99). Parikka is making the case here for New Materialism as a sort of meta-materialism which acts as a methodological guide to assist and advance the consideration of the varied aspects of materialism. The notion of performative materialism as discussed through Bolt’s *methexis* and Barad’s *intra-agency* then could be seen as one possible perspective which can help to understand how practitioners work with light in moving image production and may be considered in a broader framework of New Materialism and media theory as indicated by Parikka.

The process of lighting in moving image practice involves the orchestration of light in front of a camera during production as well as control over the passage of light from a source through capture to eventual display. Developing an understanding of this which utilises the suggested perspective of materialism would be to cast the lighting practitioner as a participant in a series of material relations that generate images with real physical presence in the world, in which the images themselves perform (or are generative of) material effects rather than existing as the result of them. This performative view situates the practitioner in a concurrent, symbiotic relationship to light. Rather than a revealing force that sits outside of material processes, light can be seen as an implicated force to be worked with akin to the way that a potter might throw clay or a basket weaver might ply reed.

This view can also further elucidate Merleau-Ponty’s (2002, p.360) notion that light becomes “localised” on the screen as discussed earlier and evidenced in his suggestion that “reflections and lighting in photography are often badly reproduced



because they are transformed into things.” It can be inferred from this that Merleau-Ponty’s notion of light appearing on screen entails a material process in which images have a physical presence, and a performative perspective of materiality might extend this idea to suggest further that light itself is implicated in the “thing” transformation that he describes. Merleau-Ponty suggests such a view in his description of film viewing whereby “the lighting directs my gaze and causes me to see the object so that in a sense it knows and sees the object” (2002, p.361). While this might easily be mistaken for a dualist perspective in his seeming division of subject and object, Merleau-Ponty is going beyond the Cartesian notion of light equated to knowledge here by bestowing a sort of implicated agency rather than presuming it to be a neutral form-giving force. This “knowing and seeing” that he suggests is important as it indicates the active *character* of light itself in the constitution of moving imagery (my emphasis).

The difference between Merleau-Ponty’s suggestion of lighting “localised” on a screen and the performative materiality that I’ve outlined through Bolt and Barad however, is that in this latter view materials are not static entities in the same manner as the objects that Merleau-Ponty indicates but rather materials are seen as existing in a constant state of flux. As Barad argues, the performative nature of matter generates boundaries through *intra-action* (relations from within) and these boundaries are permeable and continuously changing. Bolt also suggests a similar changeability for the notion of *methexis*, arguing that matter is transformative and transformed.

The writing of Tim Ingold, who specifically discusses creative processes of making, can help to outline further how a performative understanding of materiality might relate to lighting in moving image practices. Ingold outlines materials as:

substances-in-becoming... forever overtaking the formal destinations that, at one time or another, have been assigned to them, and undergoing continual modulation as they do so. Whatever the objective forms in which they are currently cast, materials are always and already on their ways to becoming something else. (2013, p.31)

As touched upon in the *Methodology* (pp.28-45) chapter of this thesis, Ingold outlines a theory of making as “correspondence” with materials in which the practitioner participates in an ongoing evolution of forms (or boundaries), coaxing and altering the material’s trajectory in a continuing process of change. With this notion of “correspondence”, Ingold aims to investigate the materially engaged processes of making rather than what he critiques as “hylomorphic” considerations which are focused on an idea opposed to the outcome and hence approach making as the “imposition of preconceived form on raw material substance” (2013, p.31). Following this statement, Ingold argues that materials elude description as this simply indicates a history of their attributes and instead he suggests that understanding entails a close working relationship during which the practitioner “corresponds” to the material, discovering its potentialities or *character* (my emphasis).

In addition to the aforementioned post-representation perspectives, Ingold finds inspiration specifically in Jane Bennett’s writing about non-human “vitality”. Although focused on ethics, Bennett’s (2010, p.xvi) work similarly discusses agency across human and non-human, outlining a common tradition of “vitalism” in process

philosophy to show how the term can mean “traces of independence or aliveness, constituting the outside of our own experience”. Drawing on this idea, Ingold summarises the connection between vitalism and his idea of “correspondence” in creative processes by stating: “the generativity of action is that of animate life itself, and lies in the vitality of its materials” (2013, p.97). Hence, vitalism is a useful concept within Ingold’s writing that can refer to an independent *character* of materials and will be discussed in more detail in the section of this thesis entitled Technologies of Light (p.144).

Ingold’s theorisation of making coincides with the performative understanding of materiality discussed through the writing of Bolt and Barad. This framework enables a consideration of lighting practice in which light itself can be thought of in a similar manner to other material substances implicit in creative production processes. In a similar way to Ingold, Bolt and Barad propose the ever-changing flux of matter, light thus exists in an ephemeral state, changing with the sun’s movement throughout a day or the individual photons emitted from an artificial source. In a cinematographic context, we might consider the practitioner as following a flow of light, for example, listening to its character, qualities and possibilities when illuminating each scene. This is similar to Plummer’s writing, discussed earlier, in which he argues that the specific qualities of light can elicit an animate sensation. The practitioner works with illumination to understand and coax meaning or emotion from potentialities amidst an ongoing landscape of changing light and shadow.

As I have shown, to understand light as akin to a material in moving image practice then, requires shifting perspective away from the conventional Cartesian divide between subject and object or matter and form, towards a *methektic* understanding which proposes the performative nature of phenomena such as imagery. Seen in this way, the process of lighting in moving image practices is not conducted by an individual subject, revealing meanings through forms depicted in light, but rather the practice is a set of material relations, realisations or performances between ideas and light which, through their *intra-agency*, have a physical presence and material implication in the world.

## Chapter 4: Sculpting Light

This chapter seeks to elaborate on the creative, logistical and conceptual processes of cinematography by investigating the various interactions with light that practitioners are afforded during moving image practices. Initially focusing on the arrangement of light sources in front of a camera during a production process, I outline three distinct methods that practitioners in the field can employ toward this work with light 'in' an image: *organisation*, *correspondence* and *association*. These refer to the practitioner's relationship to sources of light, their mechanism of capture and their intended audience, respectively. However, I go on to argue that these only constitute a limited view of the possibilities of the medium. Instead, I suggest that practitioners can explore uses of light more directly by considering the light 'of' the image itself and demonstrate this through discussion of a range of artists' film and video works. As outlined in my *Methodology* (pp.28-45) chapter the initial two sections of this argument use a triple asterisk to denote the change of register between autoethnographic excerpts detailing practical endeavours and more conceptual assertions to construct a fragmented, layered account that intersperses theory with practice. In the third section of this chapter I make these connections explicit while offering a suggestion of how practitioners might conceive of lighting 'orchestrations' through Gibson's (1986) theory of affordances and finally propose that a situated and distributed perspective of creativity underlines this dichotomy of lighting affordances in moving image practices and more specifically the sub-field of cinematography.

#### 4.1. Lighting the Frame

*Along the narrow passage, I round a final corner into the dark cavernous space. Thick, palpable air fills my nostrils as I cross the threshold toward numerous bright apparitions littering the expanse. A few other visitors mull around, congregating by each illuminated patch like moths to firelight. A steady whirring sound to my left indicates the original incarnation that set all of this in motion - the haze rising from below in swirling torrents gives form to a shifting sculpture of light emitted from a hidden lamp. The seemingly holographic projection stands twice my height, visibly shimmering as its illumination cuts through the dense atmosphere, reflecting off indiscernible particles of fog to create a tangible impression of presence. The minimal form gradually evolves from a single line penetrating space into a luminous cone emanating from the bright, fixed point. My hand reaches out and passes through the shaft without any resistance, interrupting the apparent structure to cast a shadow on the large white adjacent screen. As I move around the form, a changing perspective reinforces its three-dimensionality - my attention fixes on the streaming light while attempting impossible physical interactions with the form. I watch as other people strive for similar contact, sitting amidst the moving rays, placing their limbs or heads in the beam of light to dispel its visual trickery and marvelling at how the light presents itself as at once material and immaterial.<sup>7</sup>*

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In my research I came across Plato's allegory of the a cave in relation to cinema through Stanley Cavell's (1979, p.155) description of an audience's inaccessibility to

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<sup>7</sup> Reflection on Anthony McCall's (1971-2014) 'Solid Light Films and Other Works' exhibition at the Eye Film Museum in Amsterdam, November 2014.

“the world of a movie”. If my research journey followed a typical screenplay formula this analogy might be its recurring motif - subtly appearing at liminal moments to remind this discerning viewer of an underlying theme. Plato’s allegory proposes a group of prisoners chained inside a cave, watching shadows projected onto a wall from objects performing in front of a fire behind them. The prisoners give names to the shadows mistaking them for real objects. As Nathan Anderson (2014, p.35) points out, this allegory is designed to question distinctions between appearance and reality which is inherent in ongoing cinematic debates. He even goes as far as to suggest that were Plato alive today, he may well be a filmmaker. In another instance Christiane Paul (2015, p.181) summarises these overarching similarities suggesting “the allegory of the cave captures the essentials of mediation and the construction of imagery, the relationship between light and shadow, the screen and projection”, before going on to outline how recent technologies have complicated this comparison.

The allegory is vividly brought to life from a creative standpoint with characteristic self reflexivity in Chris Marker’s depiction of the cinematic viewing paradigm in *The Owl’s Legacy* (1990), during which a voice-over narration likens the comfort of Plato’s shadow play with that of a movie theatre to suggest that revealing life outside the cave to its trapped inhabitants would actually constitute a form of violence. Perhaps most notably for this enquiry however, Nic Knowland (2015), playing homage to Vittorio Storaro’s use of the allegory as an introduction to his lighting masterclasses, suggests the cinematographer’s role is to “join with the director and crew to create emotive, enticing images so the audience enjoy looking at the back of the cave...

creating a new reality". While Marker sees this cave shadowplay as the window onto a wider world which brings representations to a trapped audience, Knowland sees it as a creative act in which practitioners construct new worlds in diverse ways to keep their audiences engaged, although both ultimately employ the allegory to suggest the allure of projected light. Regardless of how the allegory is interpreted and employed, its frequent use amongst these scholars and practitioners attests to the centrality of light in moving image ontology.

When discussing light in moving image practices, it is common first to address the way that lamps and other sources should be arranged during production. This line of investigation has given rise to a number of theories around such arrangements with an approach known as three-point lighting, perhaps most widely disseminated and proposed as a foundational working principle by a range of texts. Elspeth Kydd (2011, p116) suggests that three point lighting "has become standard because it produces a certain effect that is predictable from one use to another". Robert Musburger (2010, p.148) implies that functionality fuels this popularity as "lighting practice is based on two suppositions: that there will be enough light for the camera to create a reasonably useful picture and that the appearance will fulfil the look that the director desires... three-point lighting is designed to satisfy both these requirements". In short, three point lighting proposes the use of a key, fill and back light (usually through separate sources), which aim to provide definition and proper brightness levels for a subject through the main key light, control contrast by filling shadows with a bounce or softer fill light and distinguish the subject from their environment with the backlight. Elsewhere proponents such as John Jackman (2010,



p.96) claim three-point lighting as a “starting point for lots of variations”; this is reiterated by Bruce Mamer (2009, p.253) who attests “that setup is the starting point for most lighting. Whatever else you are doing, you almost always have to consider these points”. David Landau (2014, p.41) recognises this approach as “a foundation from which to work and not necessarily a rule”.

Three-point lighting then centres around the aesthetic functionality of each source of light and tends to be the norm for mainstream Hollywood films. It is essentially a formula, most useful in restrained situations such as portraiture or static dialogue scenes to depict subjects in a conventional manner. While consideration of these three sources might be useful in understanding the aesthetic results of changing direction or contrast of a source during a lighting process, as the aforementioned texts indicate, the approach is typically oriented toward repeatability, uniformity and consistency rather than creative expression. The limit of this is apparent when, for example, attempting to depict a subject in a particular way for dramatic effect, visually convey elements of a narrative or tackle logistically diverse scenes: all of which are likely to alter the functional requirements of lighting sources beyond a simple key, fill and backlight set up. So this approach becomes less relevant in a creative context precisely because of its utilitarian nature.

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*Remember Alfred Hitchcock’s glass of milk in Suspicion (1941), I think to myself as we begin composing the initial scene in a chic yet outdated hotel room. Although I’ve seen previous*

*images this is my first encounter with the space in person - beige tiling indicative of the era clashes with a mottled brown paper halfway up the walls while textured red sheets adorning the kingsized bed vividly stand out from the grey office like carpet. Daylight spills into the room from large glass balcony doors that are now parallel to the bed as we reposition furniture to better suit the narrative elements of a later scene.*

*Desiring naturalism for the shots that we'll be tackling first, I decide to work with the ambient illumination of the balcony doors rather than darken the space and motivate lighting from elsewhere. I'm working the Fuji 250D 16mm film stock and few Sekonic incident readings suggest the grey sky outside is too dim to provide adequate exposure for this alone, so I employ a 2.5k HMI par lamp. Bouncing this bright source from the ceiling just above the balcony doorway softens its quality and serves to supplement the illumination entering through the doors. Asking one of the camera crew to stand in the position our actress will later assume, I see this has cast a gentle directional light that helps to draw attention to expression and give definition across her face while remaining subtly distinguished from the ambient light level in the room, which is perfect for the second, closer portrait-esque shot in this scene.*

*Next, I consider the initial wider shot - a low canted angle in which the actress enters the hotel room and collects a discarded camera on the centre of the bed. This prop plays a crucial role in our narrative as the protagonist will later learn of the demise of her relationship through images found on a roll of film inside. Just as Hitchcock highlighted a glass of milk thought to contain poison with a hidden light source that gave the liquid an otherworldly glow amidst the film's low-key aesthetic in Suspicion, we intend to draw the viewer's eye to this camera with a subtle yet present halo of light. To achieve this, I use a 1k incandescent lamp with a full CTB filter correcting its colour temperature to match the*

*daylight and HMI light sources already in place then using the lamp's barn doors I reduce the spill of the light to a small pool which is positioned in the centre of the bed toward the camera. Checking my intended shot composition through the viewfinder, I realise a directly frontal position draws too much attention to this spot so decide to reduce the effect further by leaning the lamp across the head of the bed slightly, creating a side-lit outline which serves to exaggerate edges of the prop without dominating the frame.<sup>8</sup>*

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Building on the aforementioned three-point setup, Ross Lowell (1992, p.18) puts forward another approach to the arrangement of light sources which he claims is more efficient, allowing practitioners to minimise trial and error and pre-empt different lighting conditions for a given situation rather than relying on “indifferent lighting formulas”. Lowell moves away from a utilitarian approach to light sources toward more nuanced and reflective consideration in which the practitioner relates sources to their working environment. While not specified in detail, it could be inferred that Lowell is reacting against three-point lighting and its derivatives which he describes elsewhere slightly disparagingly (1992, p.74) as a “magic number” of sources. Lowell suggests that considering an image as a distinct series of planes (or surfaces) can help to visualise and conduct lighting during moving image practices. His approach proposes mentally breaking an image/frame into its constituent two-dimensional shapes and treating these as layers which should be independently illuminated to give an impression of three-dimensionality on screen. He suggests that

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<sup>8</sup> Reflection on lighting *Hôtel de la Comète* (2017) at the Canal Saint-Martin in Paris, 20<sup>th</sup> December 2016.

by studying the ways that hard and soft light sources interact with subjects or environments across various angles, distances and textual properties in their daily lives, a practitioner can develop an informed intuition that will guide aesthetic decisions toward the configuration of these planes within their images.

In a similar vein but based more on psychological foundations, Sharon Calahan (1996, p.14) writes about her work in computer-generated moving images, citing Gestalt theory's emphasis on organisation and patterning, which enables the viewer to perceive a whole stimulus rather than discerning it as discrete parts. She suggests that lighting should be approached as a method to direct the viewer's eye and that it is fundamentally linked to the geometric design of an image. Understanding "how the eye tends to group objects together" in this way, the cinematographer "can help unify a disorganised or busy composition with careful shadow placement, or by minimising or emphasising certain elements with light and colour". Although built on differing principles, these two accounts typify what I would describe as an organisational approach to the placement of lights whereby a practitioner considers first and foremost compositional elements of lighting - designed to keep a viewer engaged through effective use of patterns in the case of Calahan or through an evocation of three-dimensionality in the case of Lowell. Unlike a three-point setup this presents a more flexible perspective which could be used across a variety of production contexts as it does not rely on specific equipment or prescribed functionalities for light sources but rather directly concerns aesthetic outcomes which could be mapped to any type of source depending on the context and creative aims of the practitioner.

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*Gloomy room. An old man lays with knees to his chest on a low hospital bed - head in the lap of a nurse as his loud sobs reverberate around the cold lilac ward. A piercing shaft of light strikes across the two of them. His doctor steps into the doorway - silhouette casting a long judgemental shadow across the space. She asks if everything is okay. Nurse nods. The door pulls closed plunging them once more into shadow.*

*Our Arri SR3 is in place, Kodak 250D 16mm film stock already loaded from a previous scene and the intended framing of a medium-wide two shot now aligned in the viewfinder. As this short scene will be captured entirely in one angle, I'm lighting the space with empathetic reference to this final frame. The characters are sitting in near darkness, so I want to convey this feeling while still allowing an audience some access to their expressions. Realising that my 250D film stock is not nearly sensitive enough to expose the actual low light level in the room when the blind is drawn across the large bay window, I decide to supplement the ambient light in the room with a soft source from above. To create this effect, I employ a Kinoflo Diva light with daylight balanced fluorescent tubes which I set up behind a double layer of scrim to reduce the harshness of this relatively soft source even further. Positioning the lamp well above the actor's eye level to the left of camera gives the impression that this ambient source could be emanating from the edges of the window blinds that were visible in an earlier scene and also juxtaposes its direction with light spilling through the doorway that I'm planning to add later. An incident meter reading close to where the two actors will sit suggests f1.4 for this combination of lighting, film stock and the camera's mechanical shutter.*

*I want the shaft of light that strikes across these characters to be startling and vivid, so I decide to use hard light which will also help me to shape the shadow outline of the third character who enters this beam during the scene. I settle upon a 1.2k HMI lamp in the corridor outside the room which is more than bright enough to overpower the Kinoflo inside the room and also matches the colour balance of the film stock. I rig this light just above head height again and asking a member of the camera crew to stand in the open doorway temporarily, I move the light around slightly until a shadow aligns with the actors' intended position in the frame. Now the direction and quality of light are appropriate, I begin the more challenging part - negotiating brightness levels of these two sources in relation to my film stock in a way that will make the difference between them seem startling while not over or underexposing either value and losing details of the characters.*

*My meter positioned above the bed again, now in the throw of the HMI light, suggests an aperture of f22. Familiarity with the response curve of the 250D film informs me that this contrast is slightly too high a distinction to render detail on the film so aiming to place the HMI roughly 7 stops brighter than the Kinoflo instead, I control its output through a dimmer switch on the ballast and by repositioning the lamp further from the door until the meter reads f16. Next comes the crucial decision: placing the camera's lens setting within this 7-stop range between the two lights. Experience tells me that negative film has more latitude attributed to brightness values above middle grey rather than below, so I set the lens to f4 which gives me an adequate depth of field for the action, situates the darker parts of the scene roughly three stops below my designated aperture and the brighter parts roughly four stops above. Final incident meter checks at three points; in the dim room with the door*

*closed, in the shaft of light as the door opens and then in the shadow cast across the shaft,  
all seem promising.*<sup>9</sup>

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An alternative approach to lighting is provided by John Alton who outlined his ideas on this subject in the late 1940s after a long career behind the camera, most notably working on Hollywood film noir productions. Alton (1995, p.158) proclaims that the process of lighting in moving image practice is akin to visual music whereby different wavelengths of light correspond to different sensations or emotions within the viewer along a luminance scale that is similar to musical notation. He suggests darker values are equated with sad feelings while brighter values equate to feelings of levity, likening the use of several brightness values within an image to a musical chord and arguing that “by varying the densities of a picture, an illusion of depth and musical feeling can be created”. For Alton, the motivation for lighting seems to be sharing beauty - he describes how film passing through a projector reflects from a cinema screen to create different impressions in an audience and suggests that figures depicted within a frame combine to “cause a psychological sensation in us which is a visual concert”.

This consideration is similar to a venerable photographic approach known as the zone system of exposure outlined by Ansel Adams (2005, p.47) as the “evaluation of

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<sup>9</sup> Reflection on lighting *Not Waving* (2015) at UWE’s Glenside Campus in Bristol, Sunday 12<sup>th</sup> July 2015.

the luminances of the subject and placement of these luminances on the exposure scale of the negative". In a similar manner to Alton, Adams is concerned with the distribution of brightness (or luminance) within the frame along a scale from the darkest value to the brightest value that can be captured within an image. He suggests this approach is designed to allow practitioners to compensate for differences of perception between their constantly adjusting eyes and the neutral photographic capture processes, outlining a scale which hinges around a middle grey value of eighteen percent reflectance. Adams argues that by correlating the brightness values of a lighting arrangement to this zone system, practitioners can visualise in their "mind's eye" precisely how the photographic process will render the scene and efficiently manage the depiction of different tonalities toward realising their creative intentions.

These two practitioners are an excellent example of what might be considered a correspondence approach to lighting as they both seek to maintain control over image aesthetic through a pre-visualisation process, negotiating brightness values in accordance with their respective abstracted scales. Both of these practitioners were well known for working predominantly with monochromatic imagery, so it is perhaps unsurprising that they advocate minimal approaches that emphasise tonalities in this way. Notably, their consideration of light extends further than perhaps Calahan's or Lowell's in that they both discuss how light values are used during subsequent display processes (print in the case of Adams or projection in the case of Alton) to ensure consistency through to an audience's reception of their work. Following this, I have employed the term correspondence to describe this approach with allusion to a



second meaning. As I have outlined through Tim Ingold's writing (p.74), correspondence also refers to a focus on process and materials in discussion of creative work which I believe is pertinent for this lighting approach because it extends beyond the practitioner's immediate production environment to encompass the consideration of light throughout image capture and display

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*We've been constructing a set within this dark studio for several days already, but over the next few hours all our talk, ideas and plans around lighting that have been quietly waiting can finally come to fruition before the shoot begins tomorrow. A spoken word poem at the heart of this project alludes to emotional struggles that one might feel when transforming gender. Although hiding numerous cuts through editing, the short film will appear to take place in a single continuous shot that reflects the circular structure of the poetry and so once our lighting is set it must remain consistent to afford a sense of visual continuity. One room of the set, the director suggests, represents this character's gender at birth, stereotypical masculinity, while the other room represents their identified femininity. We aim to represent visually this torn sense of self-identity that fuels the poem and as such my lighting needs to create a distinction between the two spaces that feels equally torn or divisive. As with any other lighting setup, the predominant qualities at my disposal in achieving this are colour balance, harshness and direction so I decide to use all of these at once so that as the character moves between the spaces, their appearance will shift - the audience seeing them literally in a new light.*

*I begin by lighting the initial room, which is associated with masculinity and attempt to make the lighting here feel harsher and colder, using a high contrast, low key set up that*

*shrouds part of the actor's face in darkness to represent the tension felt in this identity. Counter-intuitively given the reasonably soft quality of light but for reasons of control and brightness, I decide that fluorescent fixtures will be best for this first room and use two Kinoflo banks - one acting as a harsh directional source from the left of the actor's initial position and another as a harsh backlight, both rigged several feet above head height. As this space is dressed to look like a living room, the light appears somewhat unmotivated, creating an unnatural and eerie impression which I feel is well suited to the initial lines of poetry that will be delivered here. Desiring a contrast of quality of light, I employ mostly HMI sources in the second room, and I'm now able to motivate their position as we specifically designed the set to feature a window positioned adjacent to the movement of the actor in this room. First, I rig a 2.5K lamp pointed through a 4x4 frame with half white diffusion about the set walls acting as a high directional soft light on the entire space, then supplementing this with a smaller 1.2K HMI pointed specifically through blinds attached to the aforementioned window. As hoped, this creates a much softer and naturalistic light across the space. However, the shutters of the blind are creating heavy strips of shadow on the rear wall of the set and the colour balance of the light seems too consistent with the daylight balance Kinoflo lamps in the other room.*

*Before making further adjustments, I first set up the Sony FS7 and using a waveform monitor to judge exposure realise that even when set to the base ISO of 2000, the space appears quite bright for the digital sensor - this is an easy fix on the Kinoflo lights where I can simply turn off half the bulbs in each fixture but more attention is required for the other space. I decide to exaggerate colour temperature distinction by using a full CTO on the 2.5k HMI light which gives an orange glow across the room but also significantly reduces the brightness of this source. In conjunction with this, I set the camera white balance to 4400 kelvin which will better reflect the differing light sources during capture. Next I place a layer*

*of bleached muslin in the window frame which serves to both soften the blind shadows across the set and also reduce effective brightness of this 1.2k HMI source slightly. Checking through the camera again reveals a soft cosy orange light now permeating across this room while the other features a harsh, shadowy and cold light - perfect to suggest gender distinctions and the underlying identity crisis conveyed in this poem.<sup>10</sup>*

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In addition to the utilitarian three-point approach and the theories of organisation or correspondence previously outlined, many practitioners have drawn upon metaphorical or spiritual associations in their work. This conception is demonstrated by Vittorio Storaro (2001, p.18), who distinguishes two fundamental principles underlying the arrangement of light in moving image practices – ‘punctiform lighting’ and ‘multiform lighting’. Storaro approaches the arrangement of light sources philosophically, juxtaposing the punctiform approach, a sort of piercing light that cuts through dense shadow, with the multiform approach which marries sources of different qualities within a scene to evoke an aesthetic with less tonal contrast. He suggests that due to inherent associations between light and life, a punctiform aesthetic represents conflict and the triumph of knowledge over ignorance or good over evil whereas a multiform aesthetic is more harmonious, seducing an audience through the equilibrium between forces on screen. His allegorical approach often draws inspiration from figurative arts to outline these symbolic connotations that

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<sup>10</sup> Reflection on lighting *Life in Body* (2015) at the University of Gloucestershire film studio in Cheltenham, 20<sup>th</sup> December 2015.

can be read into the various styles, arguing that light “plays a part on the world stage, alternating with darkness, in a spectacle portraying the ancient interaction of power and generating a conflict, a passion between two elements of a single nature, seeking to reveal the evolution of matter into energy”.

Similarly, Henri Alekan (1991, p.15) outlines experiential affiliations of different light qualities, suggesting that “image creations, whatever they are, using black and white, light and dark, with nuanced densities and varied opacity, have a psychological impact”. Alekan argues this impact is predicated upon light’s connection to the sense of vision which affords our understanding of the world so that “modulations [of light] in the hours, days, seasons, climates are intimately involved in our joys and our sorrows. Its absence causes in our unconscious a reminder of the original nothingness”. In this account, light is again related to life and darkness to death.

Storaro and Alekan, therefore, represent good examples of what I would describe as an associative approach to lighting as they utilise light sources with the intention of evoking conceptual connotations for their audience through a particular aesthetic. Although the approaches previously discussed occasionally refer to storytelling and will often be employed to support narratives visually within moving image work, the arrangement of light for Storaro and Alekan seems more directly related to these broader ambitions of a scene, drawing their main motivation from an understanding of emotion, mood or character in relation to preconceived notions toward the metaphorical nature of light and shadow.

Whether attempting to evoke an illusion of depth on a two dimensional surface, arrest a viewer's gaze following psychological organisational principles or imbue images with philosophical meaning - all of these theories toward the arrangement of light sources within an image tend to cohere around similar aims. These are exemplified by Lowell's (1992, p.120) suggestions that light can be used to: establish a narrative setting, create mood or atmosphere, improve composition and give an impression of depth on screen thereby enhancing the visual characteristics of a film. I have distinguished three types of approach toward this sort of arrangement of light during moving image practice which are namely: i. *organisational* when an image is lit in terms of its composite shapes to direct a viewer's eye and evoke three dimensionality; ii. *correspondence* when an image is lit in consideration of brightness values against an abstracted scale to maintain control over their depiction; and iii. *associative* when an image is lit with reference to contextual symbolism that attempts to convey an underlying narrative or emotion. While these might be employed by practitioners to create, define and interrogate aesthetic qualities of lighting in great detail there remain further possibilities available to cinematographers and others exploring uses of light in moving image practices that are not accounted for by this line of investigation alone.

#### **4.2. Passages of Light**

*Wandering down a quiet London side street, I notice the windows of an enticing double door entrance flickering with the shadowy outline of rotating film reels. Venturing inside I'm immediately dazzled by light reflecting off an adjacent tripod mounted mirror as a friendly*

*invigilator greets me and dutifully distributes the accompanying pamphlet. An elongated space stretches before me to explore, though I'm initially fixed on this peculiar entrance installation. Tracing a pathway from the striking reflection I notice that a smaller mirror, fixed to a waist height projector in front of me, is redirecting light from the projector's bulb which is in turn redirected by the tripod mirror creating a circular throw in which the projector spills illumination toward itself. This double bounce is carefully positioned so that two large, empty reels spinning on each arm of the Elf machine cast shadows over opaque blinds that cover the doorway behind me - the technology essentially depicting itself in a moving image loop generated by its own presence. Along the space, a dozen more reels purr away, similarly utilising shards of mirror to reflect, distort or concentrate the light that constitutes projected imagery.<sup>11</sup>*

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Referring back to the aforementioned allegory of the cave, working with lighting in front of the camera during production as explored by Alekan, Alton, Calahan, Lowell, Storaro and others is perhaps equivalent to controlling the people and objects passing in front of Plato's fire, altering the aesthetics of what appears before the trapped prisoners by casting different shapes of shadow on the wall which dominates their gaze. What if the fire itself could be manipulated though? Surely adding kindling to create brighter flames would cast more dense and vivid shadows intensifying this perceived reality for the prisoners? Or perhaps another adjacent fire could be added to multiply shadows and create overlapping forms, again altering the spectator's

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<sup>11</sup> Reflection on Guy Sherwin's (1975-2016) Light Cycles exhibition at the Christine Park Gallery in London, 25<sup>th</sup> February 2016.

visual experience? Following some of the earlier comparisons, controlling light in this manner might relate to moving imagery as a manipulation of display processes through which viewers receive captured images. If, as Knowland (2015) noted, cinematography is enticing and evoking emotion to keep audiences fixated on the wall, then working with light in this manner would seem another powerful method of achieving such engaging imagery, one not to be overlooked.

It should be noted that many practitioners exploit alternative moving image display formats for creative effect. At the time of writing, director Ang Lee and cinematographer John Toll exemplify this in their recent demonstration of a complex high frame rate 3D projection system created for the exhibition of their recent production *Billy Lynn's Long Halftime Walk* (2016), proclaimed by Benjamin Bergery (2016, p.34) as "a glimpse of the future of cinema". Outside of this mainstream Hollywood context, Catherine Elwes (2015, p.2) points toward longstanding tendencies to expand, create and interrogate alternative exhibition techniques amongst artist's film and video work, stating that "the co-existence of the mimetic enterprise of the image and the concreteness of its material support, framed by the volumetrics of the gallery space, resolve not so much into contradiction as an unfolding dialogue". An exposition of light in moving imagery then concerns this entire process of capture and display so any detailed consideration of lighting practices will be necessarily entwined with a chain of events from a source of illumination at the point of capture through to the projection system and viewer perceiving its resulting images at the point of display. Sharon Russell (1981, p.40) summarises this centrality when arguing that "the physics of light governs not only

the transmission but also the process which transforms the profilmic into the filmic.” While the term ‘lighting’ is typically used to address an arrangement of sources, filters and modifiers to sculpt the aesthetic appearance of surfaces within a two dimensional image then, it should also encompass these intentional orchestrations of capture and display processes that allow practitioners to present moving imagery in specific configurations - a distinction I will refer to as the light ‘of’ an image as opposed to the light ‘within’ an image.

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*I’m designing the illumination to appear out of darkness and move through orange to a neutral white colour and then to blue before returning to darkness again. This blue-orange dichotomy will help to achieve a sense of light moving throughout the day. I rig several c-stands with CTO and CTB filters that the light passes through as it crosses my wooden window set. Leaving a gap between these filters allows a period during the shot where the light appears neutral in colour. During this live-action recording, I employ an Arri 2k ‘blonde’ lamp, which emits tungsten light around 3200 Kelvin. Setting the camera’s white balance accordingly (the images are captured using a RAW codec on the RED MX sensor so I’m still able to manipulate white balance during post-production image processing) which ensures that these various filters maintain the desired impact in terms of colour reproduction. Evidently this complementary colour cast is not how the passage of light occurs throughout a day - the movement of the sun across the sky typically begins and ends in vivid orange or red colours as illumination approaches at a seemingly more acute angle (from human perspective) resulting in a greater scattering of light across blue wavelengths by gas molecules in the earth’s atmosphere.*



*The nuances of such a transition are arguably too complex to model in a studio but relying on the entrenched cultural conventions that viewers typically associate with different times of day enables a cinematographer familiar with such visual language to elicit the suspension of disbelief for their audience. Similarly, I know that the presence of backlight will reinforce a feeling of night and so craft the moment of the lamp to start close to the window on the near side of the camera and arch around the window to end close but much farther from the camera. This creates the impression of shadows growing and shrinking through the window, as per the passage of light throughout a day, while cloaking the window in the semi-silhouette of its own shadow by the end of my shot.<sup>12</sup>*

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Discussing early inventions at the Paris Universal Exposition in 1900, Sean Cubitt (2014, p.218) outlines some of the initial experiments and configurations around these passages of light that constitute moving imagery. He describes several unique projection approaches including Lumière's Grand Cinematographie, which boasted images of massive scale on a four hundred square metre screen doused with water as well as Grimoin-Sanson's Cinérama, which combined four projectors to illuminate a dome with images captured from corresponding aerial camera angles. Addressing similar early experiments, Charles Musser (1990, p.105) describes the numerous attempts to commercialise moving imagery in America such as Jenkin's and Armat's phantoscope, Edison's kinoscope or the Lathams' eidoloscope, each of which

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<sup>12</sup> Reflection on lighting *From Light and Shadows* (2016) at the UWE Bower Ashton campus film studio in Bristol, 24<sup>th</sup> February 2016.

presented a slightly different configuration of light source and film strip ultimately situating “the history of projected images as a cultural practice originating in the mid seventeenth century”. These early derivatives and spectacles indicate the diverse possibilities through which practitioners might explore the passage of light in their moving image work, which is sometimes overlooked in contemporary mainstream film production due to the homogenisation of exhibition outlets.

Focusing on the evolution of widescreen formats, John Belton (1992) describes how the now conventional organisation of a cinema that evolved from Nickelodeon’s during the early twentieth century to become so widely adopted, was actually an architectural remediation to the extent that “movie palaces” were built “complete with theatre stages, which facilitated the presentation of live-action prologues, dramatic sketches, variety acts and other theatrical spectacles”. Outlining this evolving cinematic configuration, Cubitt (2014, p. 219) goes on to suggest that “through all the changes in projector design, the fundamentals remain the same: force light through a small aperture onto a vast screen across a vast hall”. He argues that, as is evident in the optical properties and design of the lenses employed, this cinematic form of moving imagery “derives ultimately from the structure of Renaissance linear perspective” because the screen is framed like the proscenium arch of a theatre.

In recent years this control over the passage of light in a cinematic context has, from a practitioner’s standpoint, remained inaccessible despite the advent of digital technologies. Charlotte Crofts (2008, p.16) highlights the potential advantages

offered by this change as “digital prints are cheaper to make and transport than film prints (especially if beamed by satellite, rather than on hard disk), making it not only cost effective but also environmentally friendly, at least in terms of stock and transportation costs... the digital release print is not subject to dust and scratches”. In 2005, major American film studios Disney, Fox, Paramount, Sony, Universal and Warner Bros. collaborated in order to standardise digital projection formats, working collectively as the Digital Cinema Initiatives (DCI) to publish open architecture specifications, which define a set of aspect ratios, compression formats and file structures for digital cinema delivery. As Crofts (2008, p.20) has argued, however, there are long-term preservation issues inherent in this standardisation due to the use of lossy compression, suggesting that “data in the form it would be distributed to a DCI-compliant digital projector server would not necessarily be the data one would be aiming to preserve”. On one hand the dominance of this theatrical configuration of moving imagery as well as more recently the adoption of digital projection technologies and standardised specifications places the practitioner in safe hands, enabling them to distribute their work more widely with the security of consistency across multiple screenings; but on the other hand it affords little room for practitioners to explore and manipulate the processes of light that constitute moving imagery as it is conventionally used in the context of mainstream cinema.

Turning instead to experimental or artists’ film and video reveals more prevalent examples of this manipulation of the light of the image. In the process of outlining metaphors to connect camera mechanisms with the human eye, William Wees (1992, p.25) puts forward control over this passage of light as a central tenet in

experimental practices, suggesting that moving images “represent the same kind of ‘flow’ that impinges on the retina, the only difference being that their ‘flow’ is shaped by the filmmaker through the materials and processes of the cinematic apparatus”. Following this phenomenological approach, a huge range of possibilities could be available to a practitioner exploring the light of moving images, and in this chapter I will outline several common methods of exploiting a “flow” of light to demonstrate such potential. Artists’ film and video works often draw upon the aforementioned cinematic configurations as a subject of investigation, seeking to expose or deconstruct the tools and conventions behind mainstream moving images that are designed for exhibition in a theatrical context.

A brief examination of the work of Mark Lewis shows the potency of engaging with cinematic conventions in this critical manner. In his Venice Biennale project *Nathan Phillips Square, A Winter’s Night Skating* (2009) for example, an unnerving tension emerges between analogue and digital through the use of traditional rear projection which involved filming an ice rink on 35mm celluloid and projecting the resulting images in a studio as a backdrop for actors performances during digital capture. The superimposed relationship between these image forms is foregrounded through the exhibition of the work as a large life sized projection, bringing into light the artificiality of cinematic techniques such as rear projection through this merger, as Lewis (2011, p.125) attests: “an important visual transformation was achieved; for once film was ‘inside’ of film, film became truly modern: it could quote itself, it could use itself as its own material or subject matter”. Highlighting tensions between a cinema and gallery environments, Jihoon Kim, a film scholar writing about the

hybridity of film, video and digital forms of moving imagery, suggests that works of this sort could be:

viewed as taking on a certain impurity caused by their appropriation and reinterpretation of cinema, insofar as they refer to cinema both as a form derived from film's material and technical components and as a discourse illustrating cinema's cultural and institutional influence on the visual arts. (2016, p.243)

In one sense then, manipulation of the passage of light in moving imagery affords practitioners the ability to engage with and react to these cinematic configurations toward a critique of mainstream norms by deconstructing conventional production and exhibition techniques and also through the celebration of mainstream norms by re-working or re-mixing iconic films in their work.

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*During the first public iteration of this installation, I feel it is important for the projection screens to be elevated around head height to encourage an audience to engage with and move around the imagery. While testing, the projectors were temporarily placed on tabletops and so I've also developed a more elegant method to raise this equipment to correct height and position it within the gallery. Rather than projector stands, I've built two oblong plinths which serve to support projectors at the desired height and also highlight them as objects of interrogation. (Drawing on the tradition that while plinths in this gallery context are commonly used to present artwork/artefacts). Inspired again by my earlier tests, I clamp the wooden frames of the projection screens into two trestles which raise the image above floor level. This is effective but as I intend to remove boundaries between the image and surrounding space with this installation - to reconfigure the relationship between image and audience, it is only a temporary solution. The screen's large black frame*

*in conjunction with these wooden trestles encloses the projected imagery and, although I like this somewhat untraditional approach, the presentation of the work is foregrounded too much where it should instead disappear and enable the imagery to seem ambient within the gallery.*

*I experiment with alternative screens but find that most readily available materials are either too flimsy to remain entirely flat when hung/stood in a space or otherwise do not provide a good optical quality when projected on from both sides and as such I continue using the large Rosco screen for the second iteration of this installation. Working in a new space I find that the projected images stand out against the black walls and this darker, isolated environment suits the installation well as it helps to hide the previously mentioned framing issues. While setting up the installation I refine the intersection of the two formats slightly - adding a subtle feathering effect to the centre cut out of the digital image and increasing the projection size of the Super 8mm image by a few centimetres. This makes the digital and film images appear as though they are blending together.*

*The curators of another exhibition allocate a space for my installation in a semi-secluded area boarded by three partition walls, each featuring a large window that looks onto the work. I order a Plexiglass screen for this iteration as further testing has revealed suitability of this particular material which is sturdy enough to be hung if the sheet is at least 6mm thick. I utilise a light frosted coating on both sides of the screen which combines with the material's increased density to create a slightly diffused glow when illuminated and helps to give the projection a spatial presence. (Although this also impairs the definition and quality of the imagery slightly). Doing away with the trestles, I suspend the Plexiglas screen with two lengths of clear fishing wire tied to clamps on the ceiling. I find this method of hanging*

*is exceptionally inconspicuous and so aids the impression of a borderless image in the space.*<sup>13</sup>

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Although manipulating passages of light during production, these faux cinematic works still uphold a lens-based Renaissance perspective that Cubitt (2014, p.220-221) suggests arises from a lineage of wealth and privilege so deeply ingrained it is often forgotten. To explore how practitioners can manipulate the light of moving imagery in ways that eschew this power structure, it is necessary to look elsewhere in the field of artists' film and video. Perhaps the most apparently suitable work falls under the category of direct animation during which artists work physically with celluloid and avoid camera mechanisms altogether by scratching or marking film to create various impressions of light when the material is later projected. Vicky Smith's *Primal* (2016), for example, is an abstract animation created through a direct manipulation of film whereby she rubbed an unprocessed fogged negative. Discussing this work, Karel Doing (2017) suggests that an impression of space prevails for the viewer despite the absence of a camera during the creation process; he describes "the piece starts with a small gap in the middle of the frame, permitting a golden coloured and dancing light to shine on the screen. The gap widens and starts to take shape, producing an illusion of an organically formed space". This work then reveals the moving image as simple alternations of light and darkness, varying the

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<sup>13</sup> Reflection on exhibiting *Piccadilly Circus* (2015) in Hardwick Gallery, 31<sup>st</sup> July 2015, Arnolfini Dark Studio, 18<sup>th</sup> September 2015, and BEEF Members Show, 4<sup>th</sup> March 2016.

shape and size of the eroded gap across each frame of the filmstrip to either allow or restrict the passage of illumination creating an impression of forward motion within the projected candle-esque apparition.

An example of this practice, Smith's work is representative of experimental animations which assert physical processes directly onto a filmstrip to manipulate the projected light that constitutes moving imagery. Though often distinguished as a highly separate practice due to the context in which it emerged, experiments with video exploring signal/image processing, particularly the early constructions and configurations of synthesisers, can be seen as direct manipulations of this passage of light in a similar vein. Originally created in a live exhibition environment, not dissimilar to the performative screenings of the experimental animation just outlined, Stephen Beck's *Video Weavings* (1977) offers insight about this control over the light of the moving image through its constantly shifting colour sequences and mathematical patterns generated by electronic signal manipulation and generation.

As Chris Meigh-Andrews (2014, p.139) outlines:

Beck saw his machine as an 'electronic sculpting device' designed to generate four key aspects of video image - colour, form, motion and texture... Beck's stated concern was to open up television as an expressive medium and go beyond the manipulation of the conventional camera image to produce non-objective imagery.

Given the light-based nature of video, the key aspects Beck refers to here could be taken as direct qualities of light (colour, form, motion and texture) in which case *Video Weavings* and other synthesised works can be seen as a manipulation of the passage of light of the moving imagery via control of its electronic signal. Both these examples eschew typical camera-oriented production processes, and in so doing,



break from a representation of space according to Renaissance perspective and instead attempt to work directly with the light intrinsic to their form whether through celluloid or video.

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*I haul several large canvas bags, a box full of electronics and an Eiki NT1 projector downstairs into the cavernous basement of an old working men's club. Dust permeating the air becomes visible as the dim overhead lights flicker on and reveal several installations that have already been set up. I'm shown a rough area to situate the work and we discuss the several varieties of projection screen that are available. The previous exhibition of this project was situated in a pristine white-walled gallery which couldn't be more distinct to this characterful space. To rectify some problems from the last configuration and fit it to this new environment, I decide to raise the two projectors off the ground and increase the size of the image, opting for a large pop-up screen which is placed in the centre of the room between two pillars. This larger translucent surface can be viewed from both sides and is intended to encourage the audience to move around the space, where before the imagery had been projected onto an opaque wall and only viewable from one angle. I've also brought a supporting plinth to place emphasis on the configuration of display technology that creates this shifting analogue and digital imagery. In the gallery setting this equipment was set up directly on the floor which took emphasis away from the social media element of the work, shown through the exposed circuitry and small LCD display between the two projectors.*

*As each projectors' throw of light expands outward from the bulb, creating a larger image entails a greater distance between the machines and projection surface. Illumination from each bulb is pushed through a lens that focuses the image, however the digital and 16mm systems are equipped with lenses of different focal length and so distance between the them also needs to be greater for the two images to appear equal in size. The refinements in display technology extend to optics which afford a much shorter throw on the digital projector. The older quartz bulb in the 16mm system has a much lower wattage than the digital LCD light source so the apparent brightness of the film image also drops off much more drastically than the digital. Wrestling with these disparities between analogue and digital equipment, I tinker with the positioning and size of the two images on this screen until they appear aligned. Finally, I use a neutral density filter on the digital projector to reduce its brightness to a level comparable to that of the analogue bulb. I set up a small Linux computer which controls these projectors and load the two image loops through a USB device and 16mm print respectively to complete this installation. Once connected, these two anachronistic devices illuminate the dusty basement one after another in a social media driven perpetuity.<sup>14</sup>*

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Finally, the field of artist's film and video demonstrates a further avenue through which practitioners might explore the light of moving images. If the works outlined thus far are predominately concerned with manipulations of light during processes of image formation, then interventions at the point of display/projection also present a range of possibilities. Such works might alter surfaces upon which an image is

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<sup>14</sup> Reflection on exhibiting *#Life\_Drawing* (2017) in BEEF Brunswick Club, 27<sup>th</sup> October 2017.

projected to change appearance as in the case of Bill Viola's *The Veiling* (1995), which allows the beam of illumination from two projectors to permeate through nine layers of translucent scrim fabric in a darkened space. As Viola (1997, p.120) describes in a later exhibition catalogue featuring the work "cloth material diffuses the light and the images dissipate in intensity and focus as they penetrate further... the cone of light emerging from each project is articulated in space by the layers of material, revealing its presence as a three-dimensional form". This use of multiple surfaces gives volume to the light of the image and evokes a sense of spatial distancing that ties into figures represented in the imagery with separate channels depicting a man and woman in chiaroscuro lighting as they approach and move away from the camera.

*The Veiling* (1995) is a superb example of what A. L. Rees, David Curtis, Duncan White and Steven Ball (2011) call 'expanded cinema' in their edited collection about artwork that exploits the spatial configuration of projection. This can also be described in the terms I've outlined as working with the light of the image to control an audience's viewing experience. Another method through which practitioners might manipulate the light of moving imagery at the point of display involves distorting, reflecting, adding to or combining projections of light toward altering spatial features depicted in the moving imagery in a distinct manner. Malcom Le Grice's *Castle 1* (1966) provides an illuminating example of this, utilising film footage rescued from bins outside Soho post-production facilities in combination with a flashing lightbulb hung in front of a screen - at particular intervals the incandescent

bulb ignites, its throw of photons disrupting the ongoing projections and dazzling the audience by revealing their usually darkened surroundings.

Works that manipulate passages of light toward unique configuration between audience and screen in this way are often captured under the umbrella term 'expanded cinema', which Elwes (2015, p.170) defines as "an event that transforms space through the changing effects of projected light". She goes on to highlight that "the crucial condition for the existence of the shaft of projected light is the absence of natural light". Overall then, whether utilising and drawing attention to cinematic configurations of the passage of light in a critical manner, as in the work of Mark Lewis, controlling the light of the image through direct interventions during processes of image formation, as in the work of Vicky Smith and Stephen Beck, or altering these darkened spaces toward new configurations between audience and screen, as in the work of Bill Viola and Malcom Le Grice, the light that constitutes moving imagery can be a powerful realm for practitioners to explore. I have suggested how the exhibition architecture and standardisation of mainstream cinemas affords little room for practitioners to take advantage of light in this manner and outlined various disciplines within the more open and sprawling field of artists' film and video here to reveal some of the potential avenues that might instead be investigated toward such creative configurations of light and image.

### 4.3. Affordances

Considered through these two perspectives, the light in as well as of moving imagery, it is clear that practitioners working with the medium can pursue a wide range of possibilities toward controlling light. While I have discussed this from the standpoint of the practitioner's creative intent, it should be noted that such endeavours are reliant upon a range of environmental factors that either enable or limit the ability to achieve such goal-oriented action. Following my earlier discussion of light within an image through Lowell's (1992, p.18) organisational approach, it would be difficult to pursue this method if the production location was an empty circular room for example as this would lack the various planes that Lowell suggests should be lit independently from one another.

Similarly, without lamps bright enough to overpower the natural illumination of a location, or drapes or curtains to reduce this ambient level, the lighting method cannot be employed effectively. Furthermore, without photochemical film or digital sensors that afford the recording of light values, any consideration of light within the frame would be in vain. This indicates that lighting, in the creative terms discussed here, is a situated and distributed process whereby possibilities for the control of light in moving image practices arise through interactions between an individual and the various qualities of their environment, including the tools available at any given moment.

James Gibson's (1986, p.127) theory of affordances offers a useful method through which lighting practices might be understood, suggesting that "the affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill". This theory specifies an affordance as a specific combination of the properties of surfaces and substances in an environment taken in reference to an animal and in so doing situates affordances as the intersection between environment and behaviour - in short, a perspective that cuts across subjective/objective divides. Gibson is suggesting that the properties of an environment offer or present latent possibilities which can be realised by particular behaviours. As Anthony Chemero (2003, p.181) highlights, this follows a direct theory of perception whereby "meaning is in the environment, and perception does not depend on meaning-conferring inferences; instead, the animal simply gathers information from a meaning-laden environment".

Concerned more specifically with creative endeavours, Glavenau (2012, p.196) outlines the potential for applying this theory in practice, suggesting that "what we mean by creativity and what we mean by affordances often overlaps and creativity can be defined as the process of perceiving, exploiting, and 'generating' novel affordances during socially and materially situated activities". Glavenau goes on to expand Gibson's ideas to take into account the individual's intentions as well as routines or normative actions embedded within the cultural context surrounding the individual and hence folds the theory of affordances into a sociocultural psychological perspective. Building on this development, he proposes that creativity occurs when the practitioner undertakes behaviour that is either: materially

achievable and cohering to cultural norms but against an individual's usual intentions as s/he might be unaware of the existence of a particular affordance; or materially achievable and intended by the individual but in some way involving an affordance that rebels against cultural norms and hence is not usual behaviour; or, finally, is intended by the individual and in keeping with cultural norms but in some way not usually materially possible and hence an affordance which involves invention whereby other material potentials are combined toward their goal.

Connecting this perspective with the present consideration of moving imagery than would perhaps liken creative lighting processes to the investigation of affordances that are previously unperceived, uninvented or unexplored in the practitioner's environment. In addition, Gibson's (1986) original writing suggests that in the same way an affordance points toward both the environment and observer, the information which specifies an affordance also points two ways as information regarding the utilities of an environment is necessarily accompanied by information about the observer her/himself. In other words, to recognise an affordance is to recognise one's relation to the combination of object and environment through which the affordance is presented and hence, whilst arising through environmental observation, the perception of lighting affordances is necessarily linked to a practitioner's perception of their relation to the environment and tools at their disposal as well.

As I will show, the approaches to moving image lighting practices discussed in previous sections of this chapter can be seen, from a perspective of ecological

psychology, as a framework for creative lighting solutions as they equip the individual practitioner with methods to understand and relate to their environment in order to discover new lighting affordances. I will outline this through consideration of the arrangement of light sources in moving image production, which I've grouped into organisational, correspondence and associative approaches, in conjunction with my reflective accounts of practical endeavours that have been interspersed throughout this chapter. During the production of *Hôtel de la Comète* (2017)<sup>15</sup> for example, this short excerpt makes clear my intention to light the scene in a manner that would highlight the thematically crucial prop in a similar manner to Hitchcock's use of light in *Suspicion*. Beginning by examining the overall space, I realised that the architecture of the space, which featured large glass balcony doors, provided the affordance of a directional light source in the scene. However, weather conditions on the day in question were not suitable to provide the affordance of natural light alone as the level of ambient illumination in the room would not give sufficient exposure for the film stock; or put another way, the film stock was not sufficiently sensitive to give an affordance of entirely natural lighting in this scene.

The account describes my process of supplementing this level of ambient light in the room and based on previous experiences I employed a HMI lamp, the qualities of which afforded a close match to daylight and which, in conjunction with the decor and spatial layout of the room, provided an affordance of bouncing the illumination off the ceiling toward my subject. This demonstrates how features of the physical

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<sup>15</sup> See exhibition catalogue, pp.60-65.



environment such as the colour of paint or size of a room as well as qualities of a given lamp can impact the affordances available to a practitioner during the lighting process. Further to this, the next step in my account describes working with the camera's framing, indicating that particular qualities of a shot such as the choice of lens, distance from subject and height of the camera can again provide or limit lighting affordances. Finally, in an approach not dissimilar to Lowell and Calahan's, I describe how considering the arrangement of shapes helped me to emphasise visually part of the frame (the prop) through lighting. This process of conceptualisation reflects Gibson's assertions that the individual requires awareness of his/her relationship to the environment in order to perceive affordances. The resulting setup in which I leaned a lamp over the bed to side light the prop had always been physically possible but conventional uses for the light's stand restricted my initial action. By gaining a better awareness of my relationship to the objects in the scene, I was able to utilise this previously unperceived affordance. In other words, through the organisational approach to lighting, considering how I perceived the environment as shapes myself, I could better understand possibilities for using light in an intended way.

Considering my other accounts of practical processes further supports applying a theory of affordances to creative lighting in moving imagery. During the excerpt describing *Life in Body* (2015)<sup>16</sup> for example, my process most closely resembles the associative approach as outlined though Storaro and Alekan's writing as I attempted

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<sup>16</sup> See exhibition catalogue, pp.54-59.

to express underlining themes from the film's narrative in symbolic uses of light. Again, the consideration of camera movement and sensitivity as well as physical qualities of our set construction such as the height of walls and dimensions of each room constituted a particular range of lighting affordances that either restricted or furthered these intentions. Notably, during this process, I altered the environment by lining the set window with muslin which effectively changed the affordance of lighting from this angle to produce a softer source. This demonstrates Glavenau's (2012, p.198) assertion of uninvented affordances as "new collections of affordances generated by the combination or transformation of basic (existing) potentials". In this case the muslin held the potential to soften light while the set held the potential to motivate and shape light, therefore, by combining the textural qualities of the fabric with the size and shape of the window frame I was able to create a new affordance of lighting that would appear soft, shaped and motivated.

During the excerpt describing *Not Waving* (2015)<sup>17</sup>, my lighting process featured elements of the correspondence approach described through the writing of Alton and Adams as I was assessing brightness values within the scene and relating these to an abstracted range that corresponded to the latitude of the film stock, which further supports a situated and distributed perspective of lighting. The set up I employed initially appeared exactly as I had intended. However, when measured and related to the latitude of the film stock, the lights required further adjustment. My final solution to the scene was not dictated from 'inside' a creative mind then, but

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<sup>17</sup> See exhibition catalogue, pp.48-53.

rather negotiated between a set of intentions in conjunction with the affordances offered by a particular space, lighting equipment and the sensitivity potential of film stock. The process was necessarily shaped by the environment and adopting this conceptual correspondence method enabled me to understand better how my relation to the environment differed from the photochemical film, leading me to discover new affordances for the scene. It is important to note however that these projects I've addressed in relation to affordance theory thus far have all been destined for theatrical exhibition, which, as I've argued, presents little opportunity to explore control over the passage of light that constitutes the moving image in creative ways.

Viewing cinematic exhibition configurations from the perspective of the affordances that this arena offers to a practitioner can explain the limitations this poses when working with the light of moving imagery. The physical and technical structures in place for this setting such as vast screens, large auditoria with tiered seating and typically dark, padded walls that limit stray light or sound, as well as projection booths which often contain equipment fixed in position, all orient the affordances of exhibiting moving imagery in this cinematic context toward the aforementioned "four square coherence" that Cubitt (2014, p.220) suggested derives from Renaissance linear perspective.

Of course there are artists working around these constraints to explore new affordances. Recently for example, Ed Webb-Ingall's (2016) programme at the Glasgow Tramway Arts Centre sought to invite "the audience to rethink their

understanding of cinema spectatorship through a series of interruptions, disruptions and interventions, and to consider the physical materials of the cinema environment: the architecture of the traditional dark space, the raked seats of the auditorium, and other apparatuses of presentation". Although extremely insightful from the perspective of spectatorship, such explorations tend to be concerned with audience behaviour rather than alternative configurations or control over the projection of light that I am addressing here.

As I've outlined, exploration of this is limited by a highly defined set of potentials ensuring that most moving image cinema screenings fall into the area Glavenau (2012, p.196) describes as "the space of ordinary of everyday action, of 'what is usually done' considering physical, personal, and sociocultural constraints". Following my earlier suggestion though, the field of artists' film and video presents a range of opportunities through which practitioners can explore the light of moving imagery in their work precisely because the environment in which they tend to create and exhibit affords a greater variety of behaviours.

For instance, I've previously discussed Viola's *The Veiling* (1995), which was situated initially in the US pavilion during the Venice Biennial. Given the international scope of this exhibition, the construction and adaptation of a space to house the work would have been moulded according to Viola's desires - darkening the room and hanging sheets of scrim material at specified distances to provide the affordance of this specific type of permeating projection whereby moving imagery appeared across several translucent layers in the space. Additionally, consideration of Le Grice's

*Castle 1* (1966) epitomises environmental negotiations required to facilitate explorations of the light of moving imagery in this manner as the work could not uphold the filmmaker's intention without a hanging light bulb of sufficient brightness to overpower the projection in addition to a darkened projection space. Le Grice creates his Brechtian "novel affordance" of sudden lighting change by combining the illuminating potential afforded by the bulb and immersion potential afforded by the projection of moving imagery.

The section of this chapter entitled *Passages of Light* was again interspersed with fragmented accounts of my practical work and briefly investigating these installation projects will further an understanding of how the theory of affordances informs a practitioner's work with the light of moving imagery as well. First, the excerpt describing *Piccadilly Circus* (2015)<sup>18</sup> details how each incarnation of the installation slightly varied in its physical realisation. This evolution of the work indicates that in a similar fashion to arranging light within the image, creative exploration of the light of the image should be seen as a negotiation between a practitioner's intentions and properties of the environment. In my account of *From Light and Shadows* (2016)<sup>19</sup>, the exhibition space necessitated a relation between the two channels of the work that were different to initial intentions, thus altering how an audience could interact with the projected light. My final creative configuration arose through compromises between exhibition affordances such as the size of the darkened photographic

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<sup>18</sup> See exhibition catalogue, pp.25-31.

<sup>19</sup> See exhibition catalogue, pp.32-39.

studio, surface properties of the plexiglass screens, minimum throw distance of the projectors and original ambitions for the work.

What I hope this chapter has demonstrated is that practitioners working with the moving image are presented with a range of creative lighting possibilities, but these should be considered as situated and distributed acts whereby results arise from processes of negotiation around intentions and affordances between individuals and their working environment. By way of a conclusion, I have outlined a distinction between two sorts of lighting that practitioners can pursue during moving image practices - the light 'within' moving imagery, which is typically an arrangement of sources in front of a camera during production, as well as the light 'of' moving imagery, typically a configuration of the passage of illumination constituting the work itself. Expanding on this observation, I have shown three distinct methods toward the arrangement of light sources during moving image capture processes which are organisational, correspondence, and associative while supporting these terms through considering approaches written by other practitioners in conjunction with my creative accounts. I've outlined several routes toward working directly with the passage of light that constitutes moving imagery, giving examples from the diverse field of artists' film and video and specifying how these relate to mainstream cinematic configurations. Finally, I've employed the theory of affordances to detail how practitioners employ these lighting considerations during moving image practices, which connected my work to these surrounding concepts and demonstrated creative lighting as a distributed and situated process.

One central element lurking behind all discussion of lighting is the consideration and application of technology, without which no moving image capture or display process would be possible. Although this has been touched upon occasionally with reference to specific light fixtures or camera equipment, I have purposefully attempted to minimise conceptual discussion of technology here as the next chapter takes this as its primary subject of investigation.

## Chapter 5: Technologies of Light

Building on the previous chapter's explanation of lighting as the utilisation of affordances arising in practitioners' production environment, technical facilities and cultural context, this chapter will identify and explore the technological aspects in more detail. This chapter is concerned with the uses of technology during both processes of lighting a frame for capture and also projecting moving imagery for exhibition. I argue that technology in relation to these moving image phenomena should be read as an umbrella term – a domain within which specific equipment, tools and processes transform through use. This perspective affords a principled discussion of the increasingly diverse landscape of production and exhibition tools which supports my wider investigation toward how these shifting tools relate to lighting in moving image practices.

To begin the discussion, I would like to offer a personal perspective. When asked about my interest in practicing cinematography, I typically respond with a suggestion that this discipline represents the combination of art and craft, providing an opportunity to fulfil both my creative ambitions as well as my technical fascination with photography and image making. While it is undoubtedly the case that other filmmaking roles involve similar creative applications of technology, I would argue that in particular, cinematography necessitates a comprehensive understanding of workflow, processes and equipment across all stages of production to create moving imagery that can communicate effectively with an audience.



Philippe Vié outlines this well in relation to digital equipment when stating “cinematographers have to acquire sufficient knowledge to grasp the principles of all those ones and zeros... it is important to learn the principles of compression, colour sampling, colour depth and the Bayer pattern” (2012, p.73). Frederick Elmes agrees, moving the discussion back to traditional photochemical processes: “you have to know about technical things. You don’t need to know how to build film stock, but you should be aware of what a stock will do for you. You need to know how the laboratory develops it, so that you can understand where they have gone wrong. And its the same with digital” (2012, p.149).

It is evident that although cinematographers vary in the depth of knowledge through which they seek to understand these technical considerations, with some perhaps relying on assistants to manipulate processes for them, it is clear that all are immersed in and engage with a multitude of technologies during the creation of their work. Going further than this though, I would suggest that a creative process of lighting is not only an application or use of technologies but moreover is dependent on technological ways of perceiving an environment which enable a practitioner to pre-visualise, conduct and record these applications of technology in ways that evoke a desired visual aesthetic as discussed in the previous chapter. In short, cinematography and lighting in moving image practices, are fundamentally technical endeavours and those working within the field at whatever level are enmeshed in a complex web of technological relationships that I hope to begin to define and untangle.

## 5.1. Technological Determinism

*An expansive black, hangar-like sound studio with a hive of activity buzzing inside. I sit uncomfortably on the awkward perch of a pneumatic dolly and crane my neck to peer into an electronic viewfinder. I survey a pixelated image and check the superimposed frame guidelines to ensure physical objects before the camera adhere to the desired composition. Guidance around the edges of this tiny window specifies a current shutter angle, ISO and colour profile - all standardised measurements informing me of the various aspects of image quality this equipment will record. Leaning away from the metallic chassis, I loosen two levers beneath the camera to allow movement of a supporting fluid head and subtly reposition by pushing a protruding pan-arm against its gentle dampening.*

*Rising from my seat, I grab the hefty light meter hanging around my neck and move into the space toward several tall lighting fixtures which are beaming down into our constructed set. With the white half dome on top of the meter angled toward the closest light I press a rubberised button on the side of the device which responds with a series of numbers across its fluorescent green LCD. Considering this reading, I hastily return to the rig and operate a small silver toggle switch on the side of the camera to increase the gain setting and effective sensitivity to light. Distracted for a moment, my eyes drift along a coil of grey coaxial cable extending from the rear of the camera which leads to the director, hidden away from the set a few meters away behind two small monitors as he oversees all of these adjustments. Acutely aware of this observation and our looming time constraint, I turn to the camera assistant who has been flushing dust away from the lens with a can of compressed air and suggest we go for a rehearsal. Mounting the dolly again I peer into a*

*viewfinder toward our constructed world once more; surround by and in tune with all of this technology I brace for movement as the grip begins inching the wheels forward.*<sup>20</sup>

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Previous studies of technology have primarily attempted to offer an account of technological factors in relation to varying styles of cinematography with a hypothesis that technology and aesthetics are intrinsically connected. Patrick Keating (2014, p.3) outlines the rationale of this approach in the introduction to his historical account of the discipline, stating that “the causal relationship between technology and style can go both ways. Just as a new technology might spark cinematographers to explore a new style, the stylistic preoccupations of cinematographers might push the industry to invest in certain technological research likely to have market potential”. Similarly, Barry Salt (2009, p.401) investigates technological change through stylistic developments, drawing heavily on trade journals to offer an account in which “the films themselves form the basic material for research and reference” while proposing a “detailed rational explanation for what happened in the development of cinema”.

Although these texts make it clear that technological change in cinematographic equipment or processes correlates to shifting film aesthetics over time, they stop short at a description and critique of such changes without fully considering the

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<sup>20</sup> Reflection on lighting *Life in Body* (2015) at the University of Gloucestershire’s film studio in Cheltenham, 20<sup>th</sup> December 2015.

broader question of how and why they occur, or the implications changes might have had for a practitioner working in the field. Technological determinism is a risk for historical accounts using this approach as the authors tread a fine line between acknowledging an impact of technological change on film aesthetics without showing how the technologies themselves are causal. Picking up on this, Keating (2014, p.4) clarifies Salt's approach (as well as his own) by stating "Salt explicitly denies that technology drives stylistic change, instead, he emphasises the determining power of filmmakers' intentions, praising the filmmakers who innovate the most influential styles". Herein lies a fundamental divide amongst these studies - whether the emphasis should be placed between the filmmakers (or society), and the physical equipment (or technology) when accounting for complex relations and changes between the two.

A deterministic technological perspective and the associated shortcomings of this line of enquiry can be glimpsed in Vilém Flusser's writing on photography in which he suggests the invention of technical images is the second revolution in human culture. Flusser (2000, p.10) argues that image technology is warping our individual experience of the world to the extent that "human beings' lives finally become a function of the images they create. Human beings cease to decode the images and instead project them, still encoded, into the world 'out there', which meanwhile itself becomes like an image - a context of scenes, of states of things." This notion of sensory enslavement through technological means has similarities to Martin Heidegger's writing on technology, which will be discussed in more detail later in this chapter. Briefly, in Heidegger's (1983, p.4) view, technology does not address specific

physical functions (such as machines or processes) because it is a mode of experiencing or “revealing” and “the essence of technology” is found in the way we encounter entities. Heidegger (1983, p.20) argues that we see and understand entities through the lens of technological procedures and is especially critical of an overarching technological bias in human activities or ways of thinking that he terms “enframing”. This perspective is similar then to Flusser’s argument that photography is a dominant cultural technique through which reality is understood and conditioned. Flusser (2000, p.27) likens creative acts of image making to moves in a chess game; he argues cameras have a finite set of programmes which the user operates within (similar to how players follow the rules of a chess game) suggesting that “photographers are inside their apparatus and bound up with it... This is a new kind of function in which human beings are neither the constant nor the variable but in which human beings and apparatus merge into a unity. It is therefore appropriate to call photographers functionaries”.

Unlike Keating and Salt, there is no question of style or aesthetic choice in this account of photographic practice. Instead, Flusser’s (2000, p.73) view advances the notion that technology defines human activity. While he recognises the role of social feedback in changing specific cameras, for instance, his larger cautionary picture is one in which society is conditioned by the “photographic universe” because cameras, like other apparatuses “were invented in order to function automatically, in other words independently of future human involvement... and this intention has been successful without a doubt”. The qualities or “programmes” of technology in Flusser’s words undeniably have an impact on a practitioner’s image-making.

However, I've previously argued for the role of creativity in lighting processes, which signposts the agency of the individual against or within this set of finite possibilities. In moving and still image making, for example, practitioners frequently utilise their camera against its intended purposes; they might break or reveal the mechanisms at play behind their work in self-reflexive gestures or utilise outmoded tools in their work for a particular aesthetic effect. Flusser's account of photography removes authorship over aesthetic then by taking a narrow perspective on the drive toward perfection in technological developments. Indeed, the limitation of deterministic perspectives of technology, in general, is the failure to account for human agency. This is particularly true with regards to lighting, which can be entirely natural in its origin (such as working with the sun as available light) but still aesthetically and technologically controlled by the practitioner (through their choice of lens, filters or light modifiers etc.). Therefore this perspective will not offer a complete account of the relationships between an individual and their equipment during moving image practices. As Heidegger (1983, p.4) warns, being ensnared by technological ways of thinking prevents a true understanding as "we are delivered over to it [technology] in the worst possible way when we regard it as something neutral; for this conception of it, to which today we particularly like to do homage, makes us utterly blind to the essence of technology". Given these shortcomings, Keating's proposition that development in cinematographic style is a two-way exchange between practitioner and technology offers a more attractive and inclusive suggestion of how technology might be considered in relation to lighting practices.

## 5.2. Apparatus

*Alone in a mid-sized multiplex screen, I stroll up the aisle and take my position in the tiered seating two thirds back from the screen. As the house lights dim, an immense excitement arises with the thought of this impending private viewing experience. Amidst the darkened atmosphere a projector quietly ignites and the shaft beams overhead as I start a timer on my phone, reach for my notepad and line up a new report form. Interrogating the digital realisation of this production, I'm specifically looking for abnormalities in the viewing experience - overarching issues that will disrupt an audiences' engagement with the work such as incorrect projection aspect ratio or deafening sound levels, as well as more subtle pictorial artefacts like banding, aliasing, noise and pixelation. Production logos fill the screen and flash past without obvious defects but my attention is piqued as the opening shot lingers out of focus on coin-operated slot machines for a few moments. Is this the result of faulty projection or an intentional creative choice of the work?*

*A few beats later, the lead actor steps into frame perfectly sharp and I'm reassured that focal distance of the projection lens is indeed accurate. Bathing in light reflected from the towering grey surface I become uncomfortable after the initial few scenes and realise these images are not conforming to the standardised twenty-four frames per second that I'm accustomed too. Every ten to fifteen seconds the image seems to lapse slightly as if a frame is missing which I find quite disorienting - objects and characters on the screen suddenly leap to a new position forcing the eye to readjust to this slightly altered composition. Although minor, this effect is consistent and distracting enough to warrant reporting so after enduring the entire production in this way I scribble dropped frames along with a few other minor issues on the form and suggest the projection is revisited.*

*Later I discover the digital cinema package from which the production was screened had been created by the filmmakers themselves rather than festival technical staff and, although my role is reporting rather than diagnosing, I figure an incorrect frame rate conversion had taken place during the compression of the digital files which led to these apparent dropped frames in playback. With this first problematic viewing, the technical intricacies of a theatrical screening weigh upon me - specific encoding formats required for digital projection systems as well as the physical format of an environment and optical alignment of hardware to present moving imagery in its best possible light, all revolving around the typically undiscerning spectator.<sup>21</sup>*

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Flusser's writing also employs a heavily theorised term in studies of moving image technology - the apparatus. Following William Wees' (1982, p.50) discussion of the popularisation of a corresponding theory amongst film scholars around 1970, the notion of an apparatus "carries the weight of two French terms: l'appareil, the basic machinery of cinema... and le dispositif, the combined physiological, psychological, perceptual and social mechanisms which provide a means of articulation between spectator and film". Broadly speaking then, apparatus theory argues that perceptual conventions of moving images, such as lighting techniques, for instance, are constructed according to ideological assumptions toward what ought to constitute a 'picture of reality' and how it should be seen. Jean-Louis Comolli a prominent figure in French New-Wave cinema, whose writing appeared on numerous occasions in the

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<sup>21</sup> Reflection on print viewing at the Edinburgh International Film Festival, 16<sup>th</sup> June 2015.



influential *Cahiers du Cinéma* journal and whose work is closely associated with this theory, shows how original uses of the term apparatus differ from Flusser's. Comolli argues "the historical variation of cinematic techniques, their appearance-disappearance... depend not on a rational-linear order of technological perfectibility nor an autonomous instance of scientific 'progress', but much rather on the offsetting, adjustments, arrangements carried out by a social configuration in order to represent itself" (1989, p.121).

This idea is reinforced in relation to the discussion of production processes by Jean-Louis Baudry (1974, p.46) - another writer involved in *Cahiers du Cinéma* - who suggests "the ideological mechanism at work in the cinema seems thus to be concentrated in the relationship between the camera and the subject... What emerges here is the specific function fulfilled by the cinema as support and instrument of ideology". Baudry, alongside Comolli and other affiliated writers, employs the notion of an apparatus to distinguish cinema from other art forms on the basis of its mechanical realisation and reproducibility. Their argument hinges around the representational qualities of photographic imagery, and they use this to interrogate ways in which cinematic techniques depend upon and reflect society. In stark opposition, Flusser (2000, p.35) suggests that although "the apparatus functions as a function of the photographer's intention, this intention itself functions as a function of the camera's program". In this view, technological factors are ultimately given precedence over ideological factors when considering changing/developing of techniques. Again it is clear by contrasting these approaches that neither a deterministic technology-centric perspective like Flusser's nor an

ideologically-oriented perspective akin to Baudry and Comolli's can adequately account for the relationships at play during a practitioners creative lighting processes.

A problem arises between the two approaches in that they seem to be mutually exclusive. It is impossible to suggest that photographic imagery conditions human experience of the world - Flusser's (2000, p.26) view that people are subservient to a "programme" of the "photographic universe" - while also upholding that photographic mechanisms are fundamentally socially constructed: Comolli's (1980, p.122) view of the apparatus as an "arrangement" which "gives techniques a social status and function".

In order to escape this contradiction and find a viable way of accounting for technological relationships within a practitioner's lighting processes, it is necessary to retrace the roots of these perspectives to find a common predecessor and to interrogate further their central notion of the apparatus, or the uniqueness of the photographic form. Writing in the aftermath of the Second World War, it could be said that André Bazin's highly influential work paved the way for ontological discussions of the cinema. Attempting to answer the question 'what is cinema', Bazin's (1960, p.7) central thesis that cinema should be considered apart from other art forms due to its mechanical processes is exemplified by his claim that "originality in photography as distinct from originality in painting lies in the essentially objective character of photography".

The impact of this notion in the field of film studies is thoroughly acknowledged. As an example, Stephen Rifkin (2011, pp.26-27) investigates Bazin's cinematic ontology in his doctoral dissertation, unravelling the many interpretations of this work in both English and French language film criticism, suggesting:

it is well known that it was Bazin's ideas to which the contributors to *Cahiers* themselves looked for inspiration. This genealogy (Bazin-Cahiers-English-language auteur theory) comprises a central part of the now-standard origin myth recounted in intellectual histories of Anglo-American film criticism and theory.

Rifkin (2011, p.176) later outlines how Baudry, Comolli and other writers associated with apparatus theory reject some central ideas in Bazin's work in their suggestion that the film spectator is offered a "position of illusory mastery" rather than a Bazinian objective "impression of reality". These distinctions are less important than the debt that apparatus theorists clearly owe to Bazin's work and maintain the central notion that mechanical processes distinguish cinema from other art forms.

Similarly and perhaps more directly, Flusser's perspective can be seen as drawing upon this notion, even employing similar language to the renowned mummification analogy in Bazin's *The Ontology of the Photographic Image* (1960). Flusser (2000, pp.16-17) suggests the "fascination that flows out of the television or cinema screen is a different fascination from the sort that we observe in cave paintings or the frescoes of Etruscan tombs. Television and cinema are on a different level of existence from caves and the Etruscans". Again it is the distinctness of cinema (or moving imagery in general) here that forms the basis for Flusser's technologically deterministic argument. The significance of Bazin's argument about cinema's

distinctiveness are well summarised in Stanley Cavell's (1979, p.23) personal and philosophical discussion of "movie-going" when he writes "photography overcame subjectivity in a way undreamed of by painting, a way that could not satisfy painting, one which does not so much defeat the act of painting as escape it altogether: by automatism, by removing the human agent from the task of reproduction".

This response to the ontological problem of the mechanical nature of cinema - outlining it in opposition to the preexisting 'plastic' arts - is reductive because it fails to recognise the technological relations present in other creative practices. While painting and sculpture, for instance, might not be as visibly mechanically dependent as the photochemical processes that constituted cinema in the era during which most of these arguments were formed, they still employ a set of technological tools (the brush, canvas, chisel, furnace etc.) during their formation. Plastic arts also involve a correspondence with materials (paint, clay, wood etc.) in the same manner in which I've proposed light to be the 'material' of moving imagery. If we reject this distinction between cinema and other arts, Bazin's (1960, p.7) proposition that "the conflict between style and likeness is a relatively modern phenomenon of which there is no trace before the invention of the sensitised plate" is also brought into question. As moving imagery has proliferated beyond the proscenium arched theatre, merging with other forms of communication in recent years, it is perhaps easier with hindsight to approach this not as a unique form due to its mode of realisation, but rather as a series of technological relations occurring throughout a process of creation similar to any other art practice.

To summarise, the writers I've discussed in relation to moving image technology thus far (with the exception of Keating and Salt, used to introduce the subject) seem haunted by the modernist notion of cinema as a unique art form. As such they all present incomplete and limited accounts of technological relationships implicit in the creation of moving imagery; whether focusing too intently on the technological factors as a driving force themselves or instead on the ideological/societal factors as an explanation for change, their attempts to understand what distinguishes a moving image from other art serves to produce, one way or another, a narrow perspective of technology.

### 5.3. Social Constructivism

*Two girls spring across the frame hand in hand, their silhouettes dance against a backdrop of Parisian rooftops seen through large balcony doors. A neglected cigarette burns in the foreground with pleats of smoke gently rising amid vibrant red decor. The characters dance closer and become more intimate as a metro carriage pierces the frame along an elevated track in the distance. They kiss. A first kiss perhaps. The scene moves into closer shots revealing their affection.*

*Light sources are rigged around the camera's canted framing and peer into the depicted space from almost every direction. I'm navigating between exposure levels within this dingy hotel room and those outside in the grey Parisian weather. Two overt visual metaphors are at play in the scene; a discarded cigarette in extreme foreground and the passing train in the extreme background. The action is staged so that our characters move across an imaginary diagonal line that dissects the off-centre composition. The scene is supposed to*

*feel spontaneous and exciting yet also distant - vaguely surreal as if half-remembered. Aware of the depth of action here I anticipate a small aperture around f16 to ensure the entire frame remains sharp and set my lighting ratios accordingly.*

*A harsh HMI par spills through the bathroom doorway, illuminating the foreground with a stark side light. This casts a picturesque shadow from the actors and is complemented by a subtle natural bounce from the wall to camera left. Another small tungsten fixture is clamped at the head of the bed and wrapped in CTB. Just out of frame this source serves as a backlight for the smoke, provides gentle fill on the actor's face while she sits in the foreground and creates a small spotlight around the ashtray where she will discard the cigarette. In contrast to this artificial light, the balcony doors in the far right of frame permeate a soft, dull illumination into the background of the frame. A dark area remains in the middle of the room which helps to create a lower-key aesthetic and ensures the actors are silhouetted as they dance.*

*My stock is 250D, and with such a small iris restricting the passage of light that will expose this film, the fixtures are brighter than I might usually employ in an interior scene of this sort. Much of this work is conducted by eye with previous experience setting contrast ratios bestowing me with a keen sense toward variations of brightness as well as the direction, colour and patterning of light. The final and most important stage, however, relies upon a light meter. While I may have the wherewithal to determine the type of fixture and rough angle to achieve a desired aesthetic, my process also relies heavily upon the more accurate and reliable measurements of this photodetector instrument to fine tune the orchestration of illumination.*

*In this instance, I use the Sekonic's spot meter function, turning the device on its side and uncapping the viewfinder which allows me to peer through a small lens into the scene.*

*Situating myself close to the camera to ensure these reflective readings relate to the capture device I point the meter toward each of the aforementioned areas in the room.*

*First, the glimmering quartz ashtray in the extreme foreground, then the actor sitting patiently waiting in her opening position, then the dark middle area of the room and finally toward the window and naturally lit exterior. Each reading is stored by the digital meter and I employ the averaging function which gives me an exact middle exposure value between these areas.*

*In principle, setting the camera to the suggested f-stop for this average exposure would render the scene as best as technically possible, giving an even distribution to highlights and shadows. I have however designed the aesthetic to contain darker areas in the frame so while the average exposure is useful I have look beyond this to the small pixelated scale upon which my meter displays its range of readings to determine an f-stop or to determine what lights need adjusting. Because the dark areas of the scene are intended to remain under-exposed, they throw the average off and would over-expose parts of the scene that I'd planned to appear at middle brightness value. Working with this tool then enables me to make detailed exposure calculations, to light in a more subtle manner, to relate visible surroundings to a capture mechanism. The light meter extends my senses when orchestrating illumination.<sup>22</sup>*

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<sup>22</sup> Reflection on lighting *Hôtel de la Comète* (2017) at the Canal Saint-Martin in Paris 20<sup>th</sup> December 2016.

A question persists therefore about how to get beyond the deterministic versus ideological perspective of moving image techniques and find a more nuanced way to account for a practitioner's relations to technology during lighting processes. As I will argue, an account in this intended fashion might draw partially upon a social constructivist perspective. Wiebe Bijker, Thomas Hughes and Trevor Pinch (1993, p.3) herald social constructivism as "moving away from the individual inventor (or 'genius') as the central explanatory concept, from technological determinism and from making distinctions among technical, social, economic and political aspects of technological development". The authors suggest three applications of the term technology in relation to human behaviour as encompassing physical artefacts, activities or processes and applied knowledge such as the design and operation of equipment.

Social constructivism sets a precedent for approaching social orders (the hierarchy and working practices of a film crew orchestrating light for instance) from a humanistic perspective; arguing that these structures, while commonly taken for granted, are actually dependent on historical and culturally variable conventions. In "showing how technology itself can be understood as a social product, or at least as possessing a social dimension", Bijker, Hughes and Pinch (1993, p.307) extend this humanistic approach to the study of technological structures and highlight how these result from a series of concerted practices at the level of the individual. Therefore, in relation to cinematography, we could perhaps argue for the advent of new lighting technology as a response to stylistic and cultural fashions such as the glamorous soft sources designed to flatter star actors and actresses in 1930s Hollywood films, or the



dramatic chiaroscuro shadows of the film noir productions that followed in the 1940s and 1950s.

An example of this social constructivist perspective can be found in Brian Winston's (1996, p.6) writing, specifically in his argument that:

if technologists are working to an agenda determined by society and subject to further social forces such as their own conditioning, they are not as likely to make 'eureka' discoveries. They are, as the historical record demonstrates, more likely to find similar or identical solutions for the same social need and to do so more or less at the same time.

Building on the reductionist determinism (technological vs ideological) debate, Winston suggests that an intersection of science, technology and the social sphere drive changes in "mass communication" which, in Winston's view, incorporates moving imagery. Citing this example of the competing and often concurrent nature of technological "discoveries", he interrogates the role of inventors or technologists themselves and argues that, as prisoners of their own culture, they are limited by supervening social necessity. Winston (1996, p.6) seeks to account for "social necessity, transforming prototype into an invention and enabling its diffusion", ultimately suggesting that the pace and characteristics of technological change are controlled by a social drive toward narrative and economic considerations. In Winston's view, a technologist sees the possibility for a new technology or 'prototype' based on external social forces but the development of these 'prototypes' into 'inventions' is limited by suppressing economic forces which can also control the 'diffusion' of new technologies to the wider public. Winston's model

of technological development then, with this strong emphasis on social agency and control, broadly aligns with the principles of social constructivism.

In addition, although Winston's writing exhibits some similarities to the previously outlined apparatus theory through this emphasis on social forces driving moving image technology, it is important to distinguish his approach from those set out by Baudry, Comolli and others. To begin with, those writers are concerned with different questions; Winston addresses the "ways that technological change occurs in communications" while apparatus theorists coalesce around a central interest in explaining the "mechanisms of representation" in cinema. Examining the treatment of specific cinematic changes across Winston and Comolli's writing, for instance, reveals the differences between these lines of enquiry. Comolli (1971, p.433-434) writing about early lens choices and depth of field, argues that "the ideological instrument cinema was made as a gamble and staked itself completely on the desire to identify, duplicate, and recognise 'life' in visual forms... cinema is itself produced within these codes and by these systems of representation, completing, perfecting, and surpassing them". Winston (1996, p.41), by contrast, discussing the introduction of colour film, suggested that:

the photographic image accommodates the previously established codes of representation just as the social circumstance in which these new images were and are consumed conform to pre-existing and culturally specific patterns... it could be argued that the entire development of Hollywood technology turns on the question of 'standards' and that these, when designated 'professional', operate as a form of suppression.

These might seem like similar statements; both recognise the impact of codes of representation and social conventions in the formation of technology but where

Comolli places an inevitability on the direction of “developments” based on a spectator’s desire for “visual-likeness”, Winston takes a more critical perspective by recognising the complex developmental process that occurs from “ideation” to “diffusion”. In addition, the approach of Comolli is limited by considering moving imagery a unique art form here whereas Winston’s perspective employs moving imagery as a wider example addressing “mass-communications” and hence is better equipped to account for factors such as the economic suppression of new technologies to practitioners or the social constraints of technologists themselves working on new equipment.

A socially-oriented framework such as Winston’s is useful therefore in considering how cinematographic practitioners interact with and help to develop their tools as arising from a set of cultural histories with social determinants. However, further clarification of the role that the technologies themselves play will be necessary to build a full account of relationships implicit in creative lighting work. I have discussed how the social constructivist approach necessarily presents a people-centric perspective concerning technology, seeking an understanding dominated by its human uses and applications. Hence, although he gives a compelling overview of developments in moving image equipment and their social connotations, the sort of investigation pursued by Winston cannot comprehensively analyse technology itself, its qualities and features.

While offering an overview of critical discourse surrounding new media, Martin Lister et al. (2009, p.320) recognise that technology is both this culturally constructed unit

of meaning and also physically constructed objects that are themselves constitutive of cultural phenomena, reinforcing the notion that an understanding will, therefore, require considerations of the question of technology and “asking what technology really is”. They go on to elucidate further the aforementioned problem of emphasis, stating “neither the insistence on pure, physical causality, of the sort modelled on the collisions of billiard balls, nor the equal and opposite insistence on no causality, only human agency, provides the framework necessary” (2009, p.327). In summary, although social constructivism is an important perspective in understanding relationships between technologies and practitioners, it still cannot offer a complete account of creative lighting processes.

#### **5.4. Non-Anthropological Vitalism**

*A green felt curtain rolls along a curved rail that is built into the top corner where walls and ceiling meet as I heave armfuls of fabric across the studio. My half curtain is joined with another from the opposing wall and we begin placing weights around the base of the fabric to ensure the material is as visibly flat and seamless as possible. Once this backdrop is uniform I begin to light the material, using large softened florescent sources that beam down from the ceiling toward the fabric.*

*The goal is to ensure an even level of brightness across the entire surface - slight imperfections in the fabric such as folds or wrinkles will cast small shadows that change the brightness levels while harder light from a more acute angle might create spots of brightness. I meander around the curve, holding my light meter at arm's length next to the fabric and measure the levels along this entire luminescent wall, roughly reading once per*

*meter. Behind me, a reflective gold car is parked, waiting for its moment on camera. We've stretched a black drape above the roof of the vehicle to remove any unwanted reflections in the windscreen or paintwork from the lighting grid that adorns the studio ceiling. The four stands supporting this drape also have to be covered in fabric and lighting, which proves slightly more challenging. I use small tungsten sources, closing their barn doors substantially to control the spill of light and add a layer of diffusion directly onto the lamp head to soften the spread of the beam toward the green material.*

*Next, I adjust the dimmer function of the studio lights and also these additional tungsten fixtures to situate the reflective brightness level of this material roughly two f-stops below that which I intended to use when capturing this scene. Any brighter would risk green light spilling onto the actors and vehicle (which has already been placed as far away from the green backdrop as possible) while any darker would risk muddying the colour, making it harder for our software to detect and remove these surfaces during post-production. The intended camera set up involves some subtle movements, intended to enhance the impression of motion as the car supposedly drives along several distinct roads. To compensate for this, I'm placing small crosses of bright pink tape on all of the green surfaces - intended to provide a distinct mark that can be tracked to analyse the camera movement later. With the setup largely complete, I step outside into a bright summer day, the abrupt transition from dim studio to intense natural daylight causing me to squint and shield my eyes slightly.*

*I've heard stories of the supposed psychological impact that working in green screen environment for a number of days can have and start to realise how unnatural it feels to be surrounded by such an intense colour. The lighting and decor inside our studio are not designed for the sake of aesthetics as with most production situations but instead are*

*governed here by functional, technological imperatives. The bright green backdrop, exact brightness levels and pink crosses seem garish and occasionally stifling to the eye but are required for algorithms to understand and process the images, allowing specific post-production processes. The studio then is a technological domain.*<sup>23</sup>

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Conjuring explanations from perspectives with a fundamentally different grounding to those already discussed, the philosophical works of Gilbert Simondon and Martin Heidegger offer approaches more concerned with the essence of technology itself. Despite the seemingly separate world views these two uphold, Jean-Hugues Barthélémy (2015, p.47) outlines similarities in their writing with regards to this question of technology, which he uses as a bridge between their work. He suggests “it is not a misunderstanding that will underwrite the dialogue between Heidegger and Simondon, but their mutual demand for a non-‘anthropological’ thinking of technology”. Such an approach entails the consideration of technologies beyond their human usage, or, in the terms employed previously, beyond the implications they might have for a filmmaker or cinematographer’s style, which both would argue subsume technologies into categorisations based on their common workings.

The argument underlying this approach is that the technology itself cannot be understood through a consideration of its uses alone - in other words, these thinkers

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<sup>23</sup> Reflection on lighting *Not Waving* (2015) at the University of the West of England’s film studio in Bower Ashton, Bristol on Monday 13<sup>th</sup> July 2015.

separate the uses of technology and its essence; as Barthélémy (2015, p.57) puts it; “in the same way that Simondon had distinguished between technology as operation, on the one hand, and the use to which we habitually reduce it on the other, Heidegger distinguishes between the ‘essence of technology’ and its common representation as a means directed towards an end”. The classification and understanding of technology through its relation to human appropriation then potentially stifles what actually defines a technical object.

Breaking away from an anthropological consideration leads to novel ways of understanding the tools employed by cinematographers - a mechanical film camera, for instance, is perhaps more akin to a sewing machine than its contemporary digital equivalent, which itself is likely to have close similarities to a calculator, optical mouse or laptop computer. This understanding has implications for the consideration of change over time too as technology is seen to answer only to itself based on internal necessities rather than economic or societal influences. For Simondon (1980, p.22), change is rooted in greater efficiency whereby, “it is in incompatibilities produced from the progressive saturation of the system of sub-ensembles that we find the play of limits whose overcoming is constitutive of progress”. For Heidegger (1977, p.13-14) change is a sort of latent possibility in the world because “technology is a mode of revealing. Technology comes to presence in the realm where revealing and unconcealment take place... The revealing that rules in modern technology is a challenging which puts to nature the unreasonable demand that it supply energy that can be extracted and stored”. Both these approaches attempt to consider technological change without causal relation to

human actions or societal outcomes. As I will argue, this attribution of agency to non-human materials, or technical objects, can be termed “vitalist” in the manner described in *Sculpting Light* (p.74).

#### **5.4.1. Connecting Technology and Poiēsis**

As touched upon earlier, Heidegger’s (1997, p.6) investigation of technology lies in grasping its essence; he recognises that an “instrumental” approach to technology (understanding through uses and applications in a social constructivist/anthropological manner) is “correct” but suggests that this “still does not show us technology’s essence”. Heidegger argues that technology “enframes” human activity and reduces everything that is natural to a “standing reserve” for technological transformation (or “revealing”); a process that he terms “challenging-forth” and in which humans are implicated but ultimately unable to exert any control. For Heidegger (1997, p.16) this is a never-ending process which he describes as a “revealing that rules throughout modern technology... the energy concealed in nature is unlocked, what is unlocked is transformed, what is transformed is stored up, what is stored up is, in turn, distributed, and what is distributed is switched about ever anew”. In this view everything appears to be dominated by technology; people and nature are reduced to a resource for processing. However, Heidegger argues this is just one manner of “revealing” and hence warns of succumbing to a purely technological mode of thinking or “enframing”.



In his detailed analysis of Heidegger's writing on technology, Mark Blitz (2014, p.69) summarises the importance of "revealing" by suggesting that "things can show or reveal themselves to us in different ways, and it is attention to this that will help us recognise that technology is itself one of these ways, but only one. Other kinds of revealing, and attention to the realm of truth and being as such, will allow us to "experience the technological within its own bounds." Expanding upon this, Heidegger's (1997, p.35) solution to the "question concerning technology", his attempt to understand the "essence of technology", is ultimately a creative, artistic form of "revealing" because "essential reflection upon technology and decisive confrontation with it must happen in a realm that is, on the one hand, akin to the essence of technology and, on the other, fundamentally different from it. Such a realm is art". Heidegger (1997, p.35) argues that "the poetical thoroughly pervades every art, every revealing of coming to presence into the beautiful" and ascribes the Greek term "poiēsis" to this particular process or mode of revealing.

To emphasise the relevance of this technological perspective in the investigation of moving image practices, it is useful to draw upon the writing of Richard Sinnerbrink (2014, p.77) who discusses the implications of Heidegger's writing for the field of film studies. Sinnerbrink argues that cinema can be considered "a revealing or bringing-forth of complex virtual worlds; the technologically mediated projection and disclosure of a world through audiovisual images". Sinnerbrink elevates moving imagery to this creative form of "revealing", claiming Heidegger's notion of "poiēsis" is akin to the immersive experience that can be achieved through viewing some

moving image works. Specifically, he discusses the films of Terrence Malick, suggesting that:

Malick's films express a cinematographic fascination with light... such "theophanic" cinematography is a way of using the technology of cinema to express the intimate relationship between human beings, nature, and the complexity of everyday experience. We might call this the luminous 'realism' of Malick's cinema. (2014, p.78)

Sinnerbrink's (2014, p.79) case for "cinema as poiēsis" here gives a pertinent example of how Heidegger's technological vitalism and pursuit of the essence of technology might be incorporated into an understanding of moving image practices. The socially oriented perspectives previously discussed incorporate and perhaps even find their basis in the notion of "cinematic representation"; as evidenced in Winston's (1996, p.25) notion that "addiction to realism thus created in the social sphere a number of elements which were to be crucial to the cinema", or Comolli's (1980 p.133) claim that "what is at stake in the historicity of the technique, are the codes and modes of production of 'realism', the transmission, renewal or transformation of the ideological systems of recognition, specularly, truth-to-likeness". Because a technological vitalist perspective as upheld by Heidegger would not bestow the same value on representation instead seeking to investigate the poetic qualities of moving imagery, it can perhaps offer a complimentary consideration of technology.

In comparison to the representational perspective then, Sinnerbrink (2014, p.79) summarises the differences perceptively, arguing that:

Heidegger's critique of modern technology can help us acknowledge this often neglected dimension of cinematic poiēsis as an important supplement

to representationalist theories of cinematic experience... cinema is the technological art form that most intimately reveals the ambiguity of modern technology as both a danger to our nature as thinking beings and as a “saving power” that might point to new ways of inhabiting the technological world.

Overall, Heidegger’s writing shows that it is through creative engagement with and uses of moving image practices that we might tangentially come closer to understanding the essence of the underlying technologies. At the same time, he argues for the importance of distinguishing this essence from an instrumental understanding that arises through social constructivist considerations of the human uses and applications of technologies.

#### **5.4.2. The Essence of Technology Through Art**

Turning to Simondon’s similarly non-anthropological argument gives further insight into this technological vitalism. As suggested, Simondon also warns against the consideration of technology (or machines) through human applications and in a similar approach to Heidegger does so by separating function from what he terms its “mode of existence” (akin to Heidegger’s technological “essence”). Simondon (1980, pp.11-12) argues that “usage brings together heterogeneous structures and functions in genres and species which get their meaning from the relationships between their particular functions and another function, that of the human being in action”. He argues that although technology is catalysed or imbued with specific functions based on human intention, the intentions alone cannot explain the prevailing “functional organisation”.

To understand why this the case, it is necessary to examine Simondon's consideration of technology as a cultural phenomenon. The previous discussion of apparatus theory and social constructivism in this chapter indicates that studies of moving imagery favour the consideration of culture and technology as distinct topics of investigation, often defining these areas through their opposition to one another. Simondon's approach, however, dissolves boundaries between culture and technology, attempting to marry the two by arguing that inventions often outweigh their original function and extend beyond a simple resolution to the problem for which they were developed. This excess functionality demonstrates a process Simondon (1980, p.8) terms "concretisation" during which the technical object achieves its "mode of existence", or as he writes "we might attempt to define the technical object in itself by a method of concretisation... the technical object is the end-product of an evolution".

Emphasising the origins ("genesis") of technological objects and the process of their creation in this way draws a parallel with Winston's aforementioned exploration of phases in technological change from "ideation" to "diffusion". The differences here are significant however; while Winston refers to consumer demand and ideologically driven technologists to explain the popularisation of any particular technology, Simondon instead bestows innovations with spontaneity and suggests that once "concrete", technology develops independently of human or natural factors.

Offering an overview of Simondon's philosophy, Paul Chabot (2003, p.15) summarises these notions of "concretisation" and technological independence,

stating that “in operation, the technical object frees itself from its inventor. Its superabundant functionality separates it from any plans or intentions projected on to it. The object acquires a concrete character, an internal coherence”. Importantly, it is this “internal coherence” that enables Simondon to blend the cultural and technological. Through his suggestion that “artificiality is not a characteristic that denotes the manufactured origin of the object as opposed to nature's productive spontaneity”, Simondon (1980, p.46) effectively extends the notion of “artificiality” into the realm of nature. Following this, his suggestion that a “concrete technical object” exhibits self-sufficiency in the same way as a “natural object” calls into question the grounding for divisions between culture and technology. If nature can be artificially induced and technology can develop to exhibit a sort of spontaneity typically reserved for nature, then a new view of culture might “come to terms with technical entities as part of its body of knowledge and values” (1980, p.1). Simondon’s perspective thus situates technology as an “ensemble” between humans, environment and materials which incorporates technical objects (machines) into culture, distinguishes their uses from their “mode of existence” and suggests that change occurs through the self-perpetuating coherence of functions on behalf of a technical object.

To see how Simondon’s perspective could contribute to the application of Heidegger’s “*poiēsis*” within a study of moving image techniques, it is useful to draw upon Tim Ingold’s (2013, p.8) writing which explores creative making processes, drawing comparisons in the way that artists and anthropologists “study the world”. Ingold (2013, p.21) suggests that making is a “process of growth” that places:

the maker from the outset as a participant in amongst a world of active materials... far from standing aloof, imposing his designs on a world that is ready and waiting to receive them, the most he can do is to intervene in worldly processes that are already going on, and which give rise to the forms of the living world.

Here, the influence of process philosophy on Ingold's writing is evident as he argues that existence does not consist of individual objects but rather of interwoven processes of changing materials, which therefore situates creative making practices in a relationship and involvement with these processes. This is part of Ingold's (2013, p.25) wider argument against the so-called "hylomorphic" models of enquiry outlined in the *Methodology* (p.74) chapter of this thesis.

Ingold's writing takes inspiration from and has similarities to Simondon's notion of technology - just as Simondon argues that technology can be viewed as an ensemble, Ingold (2013, p.115) suggests that "technical intelligence is to be found neither in the brain nor in the hand, nor even in the tool it holds. An object that might be used as a tool is, in and of itself, no more than an inert lump of stone, wood or metal of a certain shape... It rather inheres in the *technical act*, the gesture, in which they are brought together". Ingold's use of the term "technical act" as bringing together of material and human functions is perhaps similar to Simondon's notion of "concretisation" in which a technical object takes on its "mode of existence" and so to take an approach of technological vitalism in the study of moving image practices could be to depict and understand these constituting "technical acts". Discussing this correspondence with materials further, Ingold (2013, p.110) upholds storytelling as a way to capture or communicate such processes because "they provide

practitioners with the means to tell of what they know without specifying it. They do not so much carry encrypted information as offer pointers of where to go and what to look out for". Ingold distinguishes specifications as the definition of a project through factual accuracies whereas stories, he argues, arise "in the telling". In this view, the "modality of performance" in storytelling enables those following to understand more fully work with materials during a making process due to their shared "itinerant" qualities.

This perspective shows similarity to Heidegger's argument that "poiēsis" can be a way of escaping technological ways of thinking as is necessary to understand the "essence of technology". The bringing-forth of poetic thinking, Heidegger (1997, p.21) suggests, enables "presences [to] come forth into unconcealment" in a similar manner to how technology can reveal new possibilities in the world. Both "poiēsis" and technological "enframing" operate or "bring-forth" the world in a similar way - just as Ingold (2013, p.110) argues that both storytelling and making bring the practitioner into a relationship with the world through "moving bodies and vital materials" and hence enable an understanding of one another in the process of "correspondence". Ingold (2013, p.85) hints at such a similarity when he writes; "every thing, for Heidegger, is a coming together of materials in movement. To touch it, or to observe it, is to bring the movements of our own being into close and affective correspondence with those of its constituent materials". Rather than specifications, storytelling could perhaps be one way to investigate moving image practice from a vitalist perspective - seeking to expose the creative processes which situate cinema as a form of "poiēsis" and hence reveal ways of inhabiting the world

that are not “enframed” by technological thought but that instead depict this coming together of materials.

In such accounts, recognising the formulation of technology as an ensemble catalysed by invention but ultimately responding to its own internal coherence while elucidating ways in which these structures form part of creative expression, could offer a perspective complementary to human-centric views of technology. Although storytelling might seem the antitheses to a ‘non-anthropological’ perspective outlined earlier, Simondon has demonstrated how approaching technical objects as an aspect of culture in this way, rather than as an instrument through which culture is produced, might tangentially reveal something of the “essence of technology” or “technological mode of existence” within a practitioner’s making processes. Following this, as Heidegger argued, the way to understand technology in itself may, in this case, rely upon creative expression toward and through moving image forms. Or as Heidegger summarises: “because the essence of technology is nothing technological, essential reflection upon technology and decisive confrontation with it must happen in a realm that is, on the one hand, akin to the essence of technology and, on the other, fundamentally different from it. Such a realm is art” (1997, p.35).

## **5.5. Actor-Network Theory**

*Three battered boxes wait for us in the centre of the cinema’s small foyer. Through the torn cardboard and tatty bubble wrap I can see several large film cans that house one of the last surviving prints of Luchino Visconti’s *Ossessione* (1943). I’m visiting to plan a film project*



*with the cinematheque manager but have offered to lend a hand during my time and soak up the atmosphere of this independent and iconic cinema. We carry this print along an aisle of the main auditorium into a small projection booth and set it down on the worktop. The cans are heavier than I expect though this makes sense considering the thousands of feet of celluloid contained within. The projection booth, as with others I've visited, is cramped and messy with all sorts of curiosities around to pique a film enthusiast's interest.*

*Through talking with the projectionist I'm introduced to the reel to reel projection system and learn about the history of various systems they've had in place here. This is not my first encounter with such machinery - I recall working part-time in a local cinema alongside my undergraduate studies in the days before multiplexes became entirely digital and learning how to work with the dreaded 35mm platter systems. The projectionist explains a lengthy calibration process for the two machines which enables switching between reels. As this is a changeover system in which film reels are loaded into adjacent projectors and shown consecutively, optical alignment of the lenses and positioning of the large metal bodies is crucial to ensure seamless transitions that don't interrupt the film viewing experience. Each projector is bolted into the ground to ensure the position stays accurate and, as with most cinemas, it's clear that the architecture of the space is specifically designed for alignment with several small windows opening into the auditorium space allowing a passage of light onto the large silver screen. I learn that the parallax between these two lenses is calibrated to look best for an audience member sitting two thirds back in the tiered seating and consider the relative ease of framing a digital projector in comparison.*

*We open and peer into some of the sturdy film cans to inspect the print, originating from Cinecittà studios in Italy, which, legend suggests, is one of few remaining after Second World War fascists sought to destroy every copy before the film's release. An odour of*

*celluloid fills the projection booth, a potent chemical smell that seems at once old and new, reminding me of loading countless 16mm magazines. Later, I sit two thirds of the way back, enjoying the rich detail and shimmering grain from this black and white print during the performance. Previously oblivious, or perhaps just indifferent, I now watch attentively for projection cue marks in the corner of the frame while trying to fathom the reality that at one time this experience could only be conjured through a series of heavy boxes. The physical presence of film is more than apparent.<sup>24</sup>*

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So far discussion of approaches to technology in this chapter has presented several useful perspectives; chiefly the social constructivism of Bijker, Hughes and Pinch (1993) where technology is considered in relation to its societal implications or operations and also the non-anthropological vitalism of Simondon and Heidegger where technology is approached outside of human factors on the basis of its own qualities rather than uses. On one hand then we can understand the practice of lighting as socially determined, drawing upon a set of historical practices passed down from cinematographer to cinematographer and propagated with the cultural dissemination of moving imagery amongst audiences, while on the other hand it is important to recognise that these conventions and uses do not inform us about the technology itself.

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<sup>24</sup> Reflection on projecting *Ossessione* (1943) at the Centre for Contemporary Arts Cinematheque in Santa Fe, 2<sup>nd</sup> July 2016.

This is significant as different lighting fixtures emit unique qualities of illumination for instance and, as I have argued elsewhere, varying technical processes may also impact the ways practitioners envisage or approach their creative work, so it is necessary to account for the tools themselves outside of human factors and hence pursue both lines of enquiry to form an understanding of the technological affordances I've indicated in the previous chapter. This builds on Keating's (2014) idea discussed earlier that the causal relationship can go both ways (between filmmaker and technology) to in fact suggest that changes are determined by both simultaneously, whereby understanding might entail picturing these relations from a non-hierarchical perspective. In response to this, it is useful to draw upon actor-network theory which emerges in the work of Michel Callon (1986), Bruno Latour (1996), and John Law (2009). These writers collectively conceive of the framework known as actor-network theory (ANT), which Law (2009, p.2) suggests "describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines... it tells stories about 'how' relations assemble or don't". Callon, Latour, Law and other writers in this area argue against what they describe as the insular nature of scientific method which reports findings as if they occurred completely cut off from the world.

While there have been numerous studies of technology that employ an actor-network approach which can provide points of information here, few have considered this in the context of creative practice. One of Latour's early publications outlines the failure of a high-tech subway system developed in France during the 1980s, using what he calls a "multi-vocal" account to explore why and how the

project ultimately halted before it had begun. Latour (1996, p. 24) warns of the pitfalls of discussing technology in this way, suggesting “the observer of technologies has to be very careful not to differentiate too hastily between signs and things, between projects and objects, between fiction and reality, between a novel about feelings and what is inscribed in the nature of things”. Considering technology to be partly fictional, in that it must at some point be constructed and imagined by an inventor, Latour is discussing here the importance of separating a technological fiction, or its idealised, prototype state, from the eventual, physically realised or invented incarnation. His account is sprawling and de-centred, weaving interviews and field study research he conducted into a “scientifiction” investigation conducted by an engineer and a sociologist who become spokespersons for Latour’s ideas toward studying technology. Crucially, in the preface Latour writes:

I have sought to offer humanists a detailed analysis of a technology sufficiently magnificent and spiritual to convince them that the machines by which they are surrounded are cultural objects worthy of their attention and respect... I have sought to show technicians that they cannot even conceive of a technological object without taking into account the mass of human beings with all their passions and politics and pitiful calculations. (1996, p.viii)

Here the use of this ANT approach in describing complex intersections between technical and social is foregrounded. Latour (1996, p.viii) goes on to suggest that the unusual rhetorical form of this work was necessary to “bring about this fusion of two so clearly separated universes, that of culture and that of technology”.

Similarly but taking a perhaps more traditional written form, Callon writes about the failed technological project between electricity company EDF and car manufacturer Renault which were working toward an electric vehicle. Callon begins by outlining

the social and political conditions that led to this project but goes on to recognise the technical imperatives involved, suggesting that:

there are consumers, social movements and ministries. But it would be wrong to limit the inventory. There are also accumulators, fuel cells, electrodes, electrons, catalysts and electrolytes. For, if the electrons do not play their part or the catalysts become contaminated, the result would be no less disastrous than if the users rejected the new vehicle. (1986, p.22)

ANT also provides the framework within which Callon combines technical and social considerations, in this case toward the study of the development of an electric vehicle. Callon goes on to argue that once these various constituent elements (or actants) have been established, the role of ANT is to describe their connection, and he puts forward the term “actor-world” to recognise the specific context in which these actants are performing. Callon (1986, p.23) suggests that “the notion of the actor-world makes it possible to describe the contents of technical objects and theoretical knowledge” so that “an actor-world associates heterogeneous entities. It defines their identity, the roles they should play, the nature of the bonds that unite them, their respective sizes and the history in which they participate” (1986, p.24). This aspect of ANT ensures the approach is useful in understanding technological processes as it not only proposes the redistribution of agency between human and non-human actors but also seeks to describe the context (or actor-world) that connects these actors and hence can offer an overall picture of how technology exists and functions.

As seen through the writing of Latour and Callon, understanding technology in this context entails shifting grounds of knowledge to include both sociological and technological factors. In her account of the engineering relationships involved in

bridge-building which acknowledges ANT as an underwriting intellectual tradition, Lucy Suchman (2000, p.312) argues “a reconceptualisation of knowledge and action as located in ‘ecologies’ of social-material relations... [is] meant to break down received oppositions of nature and society on the one hand, society and technology on the other, drawing attention instead to the diverse discursive and material, human and artificial elements that must be assembled together in the construction of stable organisations and artefacts”. Suchman indicates another example of this perspective in the writing of John Fujimura who seeks to understand the “sociohistory” of a branch of scientific research related to cancer. Fujimura (1996, p.2) contends that “while I give a history of this research employing selected accounts of technical achievements leading up to the proto-oncogene theory, I weave into my story an analysis of the representational, organizational, and rhetorical work done by researchers, students, sponsors, and audiences to create the ‘world’ of proto-oncogene research”. This account or “story” does not seek to advocate proto-oncogene research (the study of cellular genes that control cell division, associated with potential mutations which can contribute to cancer) or simply outline a history of its scientific knowledge but rather attempts to understand how the area came about through depiction of the broader non-scientific network that such research is conducted within - understanding that is again predicated on an ecological perspective of knowledge as social and material relations.

Although investigating highly distinct fields, these two studies share a common approach that is inspired by ANT and hence present useful blueprints that could be followed to build an understanding of certain aspects of moving image production.

By seeking this ecological infrastructure of combined human and non-human actants to account for creative lighting processes for instance, emphasis would be taken away from the individual practitioner to encompass instead the agency of diverse confounding factors including qualities of equipment itself and hence a more complete picture of technological relationships could be formed from an assemblage perspective. Discussing Latour's work in the area, Lister et al. (2009, p.338) describe the application of ANT in studies of media technology, summarising "it is as false to argue that a machine on its own has agency as it is to suggest that only humans do; rather it is the network as a whole that acts, effects and determines". In accordance with this, ANT presents an opportunity to weave together elements of both the social constructivist and the non-anthropological, or vitalist, perspectives that have been discussed.

## 5.6. The Incident Light Meter

Thank you, Vilmos, for being a great artist  
who changed cinema...  
Thank you for twisting the light meter around  
until it showed you the 4/5.6 split  
that you wanted to shoot all along. (Bergery 2016)

Not all light meters are the same. The choice of device that cinematographers or other practitioners rely upon when measuring sources of illumination during their work is personal and dependent on a range of considerations. In terms of functionality, these tools are designed to give readings that either indicates the amount of light falling on a subject in the case of an incident reading, or the amount

of light bouncing off a subject as a reflective reading. These measurements allow a practitioner to understand the distribution of brightness values in a scene and thereby to control the exposure of their images effectively. To demonstrate the potential of an actor-network based consideration of lighting in moving image practices I'm employing the incident light meter here as a subject of investigation.

Taking inspiration from the previous discussion and exploring multifarious agencies across human and non-human actors that have led to the configuration of this instrument in moving image production can enable one to outline a complex web of material and societal relationships involved in the basic practice of measuring light in the context of cinematography practices. It will also indicate how wider studies might build upon the approach toward a more comprehensive understanding of this creative process.

### **5.6.1. Functionalities of the Incident Light Meter**

Drawing first upon the social constructivist perspective that I outlined through Winston as well as Bijker, Hughes and Pinch suggests an investigation into the instrumental functionalities of the technology. Common uses of light meters are well documented amongst instructional writing toward photography and cinematography, as is their place in the current digital production landscape. Carl Salvaggio (2007, p.735) summarises this in his detailed entry on light meters, suggesting the need for exposure measurement stems from disparities between the functionality of human vision and photographic processes. This is because:



luminance is the property of visual power that most closely correlates with perceived brightness. Perceived brightness is not a very reliable measure due to the adaptive and contrast enhancing nature of the human visual system. It is for this reason that reflected-light meters are used to quantify luminance in many photographic applications.

Not all practitioners use such devices however and, from an alternative perspective, Christopher Beach in his historical account of varying film styles in Hollywood, which broadly argues against auteur theory to explore collaborative processes between director and cinematographer, offers an example of the common argument that the advent of digital technology has made the use of light meters redundant, or at least, less intrinsic to the capture process. He contends “the ability to use a light meter like a fine-tuned instrument to determine correct exposure has made the cinematographer a kind of ‘alchemist’ on the set. Through some cinematographers continue to use light meters on digital productions, it is no longer necessary to do so” (2015, p.175). This notion of the redundancy of light meters is rooted in the idea that digital tools offer additional ways of measuring the brightness values in a scene which enable the practitioner to determine their exposure. There is some truth to this in that histograms, waveform monitors and similar functions allow a close measurement of values in a scene and visualise these in a way that light meters do not. However, these monitoring tools all rely on reflective readings of light entering the camera lens, whereas a light meter enables the practitioner to take incident readings from within the environment.

Further to this, there is an inherent assumption in this argument about digital technologies that video monitoring gives an accurate representation of the

information being captured by a camera. This is shown in Beach's (2015, p.175) statement that "a video monitor records the amplitude of the visual signal and indicates where information is being lost due to highlights or shadows", which supposes the practitioner therefore has a better understanding of the information s/he is capturing. In the current production climate, on-set monitors are rarely accurate or capable of representing the full range of values captured by a camera in the way suggested; they simply offer one interpretation of the data that constitutes digital imagery. Therefore, from a practitioner's perspective relying on monitors in the fashion suggested above would be a last resort. Instead of approaching light meters as a redundant tool, overtaken by new digital forms of monitoring, I'd like to recognise them as a distinct technological artefact and suggest this is why they still feature in digital capture processes for many cinematographers. Jon Witmer highlights this continued relevance while describing of the work of cinematographer Vimos Zsigmond:

As Goodich and Zsigmond walked the basin and blocked the action with the actors, Zsigmond took frequent readings with his light meter. Even when shooting digitally, he notes: 'I always light with the meter. I go around and see what incident level is there, I spot meter the actors' faces, and I calculate that it's all within the [camera's dynamic] range. The things we do with film still apply with digital. Composition, light and shadow — that's still what cinematography is about.' (2012. p.14)

Further interviews and ethnographic work conducted with practicing cinematographers reinforce this notion that a light meter is distinct tool and reveals the range of nuanced uses during production. Steelberg (2004) highlights how it can help to provide consistency between different lighting setups, suggesting that although human vision can be tricked and monitors can be calibrated differently "a

meter will never lie. It can't be tricked. It's the one constant that you have on set to help you keep consistency". Stephen Lighthill (2014) praises the flexibility of the tool which can measure light before the production has set up a camera or monitor and claims the use of a light meter is "an artistic effort" which helps to "train your eye". Similarly, Walter Lassally suggests "you sort of get an eye for it" and outlines how he primarily uses the light meter for reassurance in his lighting work because "it usually says what you think it will say" (cited in: Ellis 2011, p.173). In contrast to this, John Alcott discusses the advantages of a particular model of light meter for candlelit scenes of *Barry Lyndon* (1975), stating that he "found a great advantage in using the Gossen Panalux electronic meter for these sequences, because it goes down to half foot-candle measurements. It's a very good meter for those extreme low-light situations" (1976, pp.339-340). From these practitioner accounts, it is clear that although the light meter extends human perception by offering dependable measurements of brightness, there is no universally agreed method for using the tool, and that the various types or brands of device have different uses dependent on the production contexts.

### **5.6.2. Development of the Incident Light Meter**

In addition to specific interactions with or uses of technology, Winston suggests the importance of understanding how a technology has emerged through ideation and diffusion, drawing upon culturally implicated individuals and institutional forces to

explain this process. According to several sources<sup>25</sup>, it is possible to trace the use of light meters in cinematography to the late 1930s, though experiments were being conducted to develop a system of measuring light for photography long before it became a necessity or there was an acceptance of this technology in moving image production. In his historical account of the first seventy years of moving image technology, H. Mario Raimondo-Souto outlines several individual inventors who might be seen as significant in the invention of the light meter that is commonly used in contemporary cinematography. He suggests that “since the experiments of the French optician Jean Baptiste Francois Soliel in 1840, with the first actinometer to measure the light intensity, and the use of selenium by Alexander Graham Bell and also by Dr. Edward Weston during the end of the nineteenth century, a solution was sought to measure light by a scientific method” (2007, p.194).

We might recognise several stages in this early era of light measuring technology before its path collided with the world of moving image production. Initially, as Raimondo-Souto indicated, the actinometer paved the way for measurements of light in relation to photographic processes. Outlining this phase in more detail through an encyclopaedic entry on the subject, Micheal Pritchard (2013, p. 4) recognises a number of inventors behind this, suggesting that “Ferdinand Hurter and Vero Charles Driffield in the 1880s and 1890s established the basic principles of densitometry and sensitrometry... the first attempt to systematically relate light

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<sup>25</sup> Discussing changing filmmaking technologies in the 1930s, Barry Salt (2009, p.217) suggests that “by this date the use of light meters was becoming quite common when shooting exteriors” and similarly Stephen Neale (2012, p.291) indicates that “toward the end of the decade, Daniel Clark... a former President of the ASC, led a move to standardize the light meters employed at the studio”.

intensity and the density of the exposure on the photographic plate". Actinometers took a variety of forms but essentially enabled determination of the chemical light sensitivity of early photographic plates which were less consistent across commercial batches and as Pritchard indicates, often made in small quantities by the individual photographer during these years.

A common measurement method involved exposing the photographic plate to light until a standard tint had been achieved and correlating the time of this exposure to a given table. As Pritchard (2013, p.5) goes on to suggest, although other methods of determining exposure were invented, the early actinometer experiments were refined, commercialised and "became the main form of this type of calculator until their demise in the later 1950s".

Another key stage for light meter technologies can be seen in the incorporation of selenium for exposure measurement, which led to more accurate and portable systems around the early 1930s that began to resemble common contemporary devices. Leo Enticknap (2005 p.112) during his historical discussion of the transition to digital moving image production technologies, discusses an early use for selenium, suggesting that "a key discovery toward making this possible was demonstrated by the British engineer Willoughby Smith in 1873, which was that the metal selenium generated small amounts of electrical energy in proportion to the intensity of light to which it was exposed. This eventually led to the production of the 'photoelectric cell'". Enticknap is discussing the introduction of optical sound recording

technologies here but the same could be said of Smith's discovery in relation to selenium based light meters which also rely upon 'photoelectric cells'.

Another historian of photographic techniques, Leslie Schroebel (1999, p.166) describes how this selenium system of exposure measurement functions, outlining that "light falling on the photocell created an electric current that caused a pointer on the ammeter to rotate over a calibrated scale. The calculator dial was then used to convert the scale number to combinations of shutter speeds and f-numbers for specified film speeds". Initially, these meters were not developed with everyday use in mind and were produced without photographic scales and limited to laboratory conditions due to the cumbersome size of batteries required to power their photoelectric cells. When the conditions for a self-generating cell were created in the early 1930s, several manufacturers began developing and commercialising dedicated selenium photography meters in competition. This history and prolonged uptake of the technology for photographic use is outlined well in the account of a legal dispute between manufacturers Weston and Dejur over the patent for "an exposure meter which directly indicates the time of exposure necessary for taking photographs" (Weston Electrical Instrument Corporation et al v Dejur-Amsco Corporation (1943) 133 F.2d 778).

Selenium-based devices can still be glimpsed occasionally in contemporary cinematography with some practitioners preferring the analogue dependability and compact nature of the design. For instance, in the online discussion amongst cinematographers around their choice of light meters, Jerome Fournier Lanzoni

(Cinematography Mailing List, 2004) suggested “the L398 analogue is a very reliable and very handy Light meter... Vittorio Storaro has done all his ‘writing with light master-piece work’ with an L398 and still works with it, because he knows his light meter”. In addition to this contemporary usage then, the selenium system is significant as the first measuring technology to incorporate the now ubiquitous hemisphere design pioneered by the Norwood Director light meter in the 1940s, of which the specific Sekonic L398 model that Lanzoni indicates here, according to the manufacturer, is a direct descendant.

Douglas Kerr (2014, p.2), an engineer and writer interested in this history, gives a thorough overview as to how the Norwood design improved functionality. He suggests that “Donald W. Norwood had the vision that a reflected light exposure meter in which the receptor was a hemisphere, rather than a flat plate as in most meters of that type, would be able, in a single measurement, to develop an optimal recommendation of photographic exposure over a range of subject and lighting situations”. He goes on to discuss how the implementation was oriented toward moving image production from its outset, highlighting that “Norwood's colleague cinematographer Karl Freund, likely at Norwood's urging, founded Photo Research Corporation in 1941, and began the design of an exposure meter to exploit Norwood's concept” (2014, pp.2-3). For the invention of a hemisphere receptor alone, Norwood could be considered an important predecessor to contemporary light meter design but he also continued working in the field of exposure measurement and published several articles outlining a broader theory toward “the various factors that are involved in photographic exposure control” (1950, p.585).

A brief look at the refined Norwood Model B which was introduced, as Kerr notes (2014, p.4), in 1948 through American Bolex and “the work of industrial designer Alpheus Maple” has striking similarity in form to the aforementioned Sekonic as well as other analog meters available today and the fact that so little has changed in this hemisphere design since its introduction seventy years ago attests to Norwood’s significance.

In a variety of other ways, light meters have changed in recent years, perhaps most notably with the proliferation of digital silicon sensors around the turn of the millennium distinguishing another stage of exposure measurement technology. Drawing again on Salvaggio’s (2007, p.740) discussion of the subject reveals the basic principles of this technology, suggesting that “silicon photocells (or photodiodes) are the most common detector material used today. These are a semiconductor material that produces a small electric current due to the promotion of electrons to higher energy states or bands in the material when exposed to incident photons.”

The application of photodiodes for digital imaging purposes is well documented and hinges around the introduction of charged coupling devices (CCD). The importance of this is outlined by Stefan Hughes (2012, p.103) in his detailed account of the history of digital astrophotography, suggesting this technology was “invented in 1969 at AT&T Bell Labs by Willard Sterling Boyle and George Elwood Smith. The CCD revolutionised the development of the Camera, and enabled introduction of the Webcam, the Astronomical CCD and DSLR (Digital Single Lens Reflex) cameras”.



Hughes (2012, p.103) goes on to note Kodak's subsequent work with CCD technology which was perhaps the most successful amongst early consumer-oriented experiments leading to a breakthrough in 1975 when "Steve Sasson a Kodak engineer develops a prototype of the first static CCD camera based on the Fairchild Imaging chip".

Although Sasson's work refashioning the commercially available CCDs toward photographic means was an important step, elsewhere it is noted that this was not a unique breakthrough. Bob Rose's (2007, p.781) encyclopaedic entry on the history of twentieth-century imaging devices reveals that "high-quality digital imaging systems were used regularly in 1973. The first commercial charged-coupled device (CCD) based digital cameras from Fairchild Imaging were fitted into orbiting satellites and became the new 'eye in the sky'". Alongside initial digital camera implementations, photodiodes were explored during these years as measuring tools in conjunction with analogue photographic processes, with the 35mm Fujica ST701 promoted as the first camera featuring an inbuilt silicon meter in 1971. However, this is an example of through the lens (TTL) reflective measurement rather than the incident approach to measurement focused on here. Examining material from the time suggests that Sekonic released the first incident meter designed specifically for photographic purposes to feature silicon photodiode technology in 1974 as shown in the Consumer Guide magazine's (1975, p.254) overview of equipment that acknowledged "so far, only the Sekonic company has introduced a silicon meter - the L-428". Following this, silicon-based light meters gained popularity due to their increased accuracy throughout the 1980s to become the dominant form of

photographic exposure measurement - the common technical underpinnings between light meters of this sort and contemporary digital camera systems bring into alignment a practitioner's method of light measurement and image capture.

Alongside these individual inventors and experimenters, the role of institutions should not be overlooked during a social constructivist account of light meters for moving image production. While Salt's otherwise extremely detailed account of film technology remains vague about the introduction of light meters, he suggests that the influence of Hollywood studios and a drive toward standardisation over time had some influence on practitioners seeking more precise measurements in their lighting work. Salt (2009, p.200) outlines how the introduction of a soundtrack negative required "very precisely controlled and reproducible conditions... which implied machine development, and so the same might as well be done for picture negative".

Salt suggests that the switch from batch processing to machine development in Hollywood production, led by Universal Studios in the late 1920s, required much more specific and standardised film stock exposure, although this did not immediately require more experienced cinematographers to seek the aid of measurement tools. Over time, however, this change led to the popularisation of light meters so that "in the late thirties manufacturers finally gave speed ratings to their film stocks using the Weston system... by this date the use of light meters was becoming quite common" (2009, p.217). Salt later emphasises this in suggesting that by the mid 1940s the widespread use of machine development, combined with the introduction of a more popular ASA standardised system for rating film's sensitivity,

along with “the wide range of film stocks available from this period onwards made the use of exposure meters mandatory on interiors and exteriors” (2009, p.227).

Turning to one of the more prevailing instructional texts from the time reinforces the notion of standardisation as a factor in the adoption of light meters, Raymond Spottiswoode (1966, p.88) outlines this transition to a uniform system in his overview of practices first published in 1951, suggesting “A.S.A. film-speed determination has been adopted in Great Britain as well as in the United States... most film stocks and exposure meters are now rated according to the new exposure numbers”. This extension of the sensitivity rating system across measuring and film stock manufacturers by the turn of the 1950s solidified the place of light meters in moving image production. Spottiswoode (1966, p.88) goes on to highlight the importance of this connection between exposure determination and the then common machine development processes, arguing that “the cameraman must remember that the image he is engrafting on film is a latent image... Only proper development by the laboratory - to which the film passes next - can make visible and permanent what the cameraman has taken such pains to record accurately”.

It is clear then that a studio imperative to process and deliver material in a uniform manner led to a widespread use of machine development and in turn to a standardised system of sensitivity rating, all of which steered practitioners toward more refined methods of measurement during their exposure calculations, or in other words the need to obtain ‘accurate’ recordings, for which light meters were an obvious aid. This institutional influence is also recognised by Raimondo-Souto (2007,

p.193-194) who, during his discussion of early Technicolor productions suggests that “this firm’s particular requisite in all technical aspects of the process induced cinematographers to obtain precise light readings during exposure of the film”.

Overall investigating the social constructivist considerations of this technology suggests that although a series of individual discoveries may have led to a workable and professional quality instrument for measuring incident light, the adoption and continued application of this in moving image production was spearheaded by the large film studios that dominated Hollywood production and their requirements imposed upon practitioners. This fits the model of technological development outlined by Winston in which the ‘diffusion’ of new technologies to the wider public is controlled depending on economic and institutional forces such as, in this case, the cost considerations and consistency of machine development.

### **5.6.3. Material Implications of the Light Meter**

As indicated earlier in this chapter, an account of incident light meter technology would be incomplete without consideration of its physical composition and individualistic character in the vitalist manner that I have outlined. To give insight into this material dimension of the tool I will briefly trace the excavation of its key raw materials and through this will show how the adoption and use of light meters has inherent environmental impact. For instance, the photosensitive cells found in earlier incidental forms rely on selenium, a mineral that is rarely found in natural concentration and typically obtained as a by-product from copper refineries.

Selenium's light sensitive properties, which greatly impact its resistance to the flow of electricity, can be seen as an example of the individualistic character that Tim Ingold and Jane Bennett attribute to materials. When using a light meter, practitioners place the selenium into a flow of light, in effect harnessing its sensitivity, to understand better or intervene in the distribution of illumination during production. The characteristics of this key material afford the repeated and objective measurement of brightness values.

Discussing contemporary media's dependence on energy and materials, Cubitt reminds us of another implication of the light meter's material qualities. He describes the pollutant residue from large-scale copper mining, suggesting that "in Zambia's vast copper pits, for example, not only has the landscape been rearranged without regard to wildlife, agriculture, or the course of rivers, but the use of explosives and drills produces silica dust that attacks the lungs, while nearby smelters release large quantities of sulfur dioxide" (2017, p.70). The shift from selenium to silicone CCD and CMOS sensors that I've discussed is reflected in the methods of harvesting and distributing these raw substances. Writing at the advent of digital technologies, Michael George's (2003, p.65.2) entry in the U.S. annual geological survey of mineral commodities suggests that in 2002 electronics (including photoconductors) only accounted for twelve percent of selenium use whereas photoreceptors "had been the largest single application for selenium during the 1970s and 1980s". By comparison, the silicone used in contemporary CCD and CMOS digital photosensors is mainly produced from quartz, which is more plentiful mineral in the earth's crust. Typically, the quartz used in semiconductor manufacture is mined from natural

deposits and specifically those found across the Spruce Pine Mining District in North Carolina. This source developed across eons as pegmatite rock grew beneath the earth's surface. Although silicone can be created artificially, for reasons of economic cost and mineral purity, the natural variety is preferred and so should be recognised as a depleting source.

In their detailed economic and environmental account of the mineral industry, Stephen Kesler and Adam Simon (2015, p.197) highlight the cost implicit in silicone which, in the metal form associated with semiconductor sensors, is produced "almost entirely by melting quartz, coke, and scrap iron in an electric furnace". As indicated, this process requires huge amounts of electricity resulting in the long-distance transportation of minerals between countries of production. Following a similar line of thought, Parikka's (2015, p.111) study of the geological implications of mediation indicates how an understanding of the production of microchips such as the digital semiconductor sensors might be useful in developing a "geology of media through a tracking of the residues and materialities that tie planetary durations, chemical compositions, and media technologies into such assemblages". Parikka utilises Jennifer Gabrys' (2011, p.26) writing as an example of some environmental drawbacks of this electronics manufacturing, suggesting that "to produce a two-gram memory microchip, 1.3 kilograms of fossil fuels and materials are required", which, due to energy-hungry silicone production, can also be extended to CCD and other semi-conductor sensors.

When considering the long-term future of a light meter rather than its past, the current culture of electronics consumption suggests this device will end up as material waste collected at sites such as Guiyu in China. In her aforementioned examination of the lifespan of electronics entitled *Digital Rubbish*, Gabrys (2011, p.129) suggests that waste materials undergo a “circuit of disposal” due to the salvage operations attempting to reclaim some of the more valuable raw elements during which “fragmented machines scatter and travel across the globe, often far from their sites of initial consumption and use” (2011, pp.129-30). Gabrys argues that due to the high percentage of electronics waste sent from developed to developing countries these recycling practices, in most cases, are simply a deferral of a final landfill destination. Hence, an incident light meter involves a formation of photosensitive materials excavated from the natural environment which continues to respond to light when placed back into that environment during its ‘working years’ before being discarded as scrap. The transportation and disposal of devices in this fashion entails similar environmental impact to their material excavation, creating vast toxic sites where Gabrys argues “materials are preserved unwittingly... electronics are embalmed, plastics endure, chemicals linger and spread, simultaneously” (2011, p.130). Although the full range of material processes implicit in the creation and destruction of a light meter are beyond the scope of this thesis, by alluding to several here, I have attempted to show how the configuration of the tool is an active physical process, beginning significantly before a cinematographer lays hands on it and with ramifications far beyond his/her lifespan.

The technological vitalism of an incident light meter is essentially its light sensitive quality and the ability to respond to brightness values in a consistent manner. To understand the qualities of an incident light meter beyond a humanistic perspective I have turned to geological considerations and indicated how the tool is part of a flow of physical activity. Whether due to a scarcity of materials or significant energy expenditure required to produce them, changes in the incident light meter are both dependent upon a supply of raw materials and also implicit in substantial environmental consequences around the world. Hence, we might additionally understand this tool through its physical, or geological, mark on the planet, recognising its material agency and contribution to a perpetual reconfiguration of the earth.

#### **5.6.4. Interweaving Social and Material Considerations**

In summary, the cinematographer's use of an incident meter, draws upon a series of inventions from Hurter and Driffield in the late 1800s to Norwood in the 1940s and then Boyle and Smith in the late 1960s. S/he also depends upon the standardisation of film speeds set in motion by the machine film-development introduced by Universal Studios in the 1940s and the widespread adoption of uniform production processes spearheaded by Hollywood studios in this era. Concurrently, a range of raw materials excavated from the earth such as selenium or quartz form the light meter which, like most electronic devices, contributes to the environmental change caused by large-scale mining and pollution.



This brief exploration of incident light meters only incorporates the very early actinometer and more prevalent photovoltaic devices that are in frequent use today – it is important to note that other methods of light measurement, such as extinction meters or photoconductive cadmium sulphide (CdS) meters, also have their place in a broader understanding of this technology. The areas I have outlined are but a few of the complex entanglements involved in the current relationship between practitioner and light meter which indicate how we might begin to understand an actor-network theory of technology in the context of moving image practices.

Throughout this discussion, a mutual dependency of the material and social factors of the light meter is apparent. For example, deposits of quartz mineral in North Carolina produce the photosensitive material that affords practitioners the action of measuring light during production. In contrast, I have shown that an economic drive from Hollywood studios in conjunction with a culture of increasingly nuanced lighting aesthetics led practitioners to turn toward more accurate measurement tools, influencing design improvements like the Hemisphere model and eventually the incorporation of silicon as a primary material. I suggest that these and other intersections between material and social implications of the formation of the light meter offer a relational understanding.

Returning to a theoretical perspective discussed earlier in this chapter, we can term these relational insights across different aspects of light meter technology an actor-network. As I outlined, actor network theory seeks to understand a phenomenon of study through the intersection of agency across human and non-human factors.

Understanding cinematography equipment such as the light meter in this manner therefore requires consideration of the ways that individualistic qualities of the equipment (its materials and properties) intersect with social forces (its individual uses and cultural context) to create a network which collectively depicts the technology.

Notably this understanding of cinematography technology is significantly different from those put forward by previous studies in the field. I have drawn upon the historical analysis to explain aspects of the light meter, such as the standardisation of film processing initiated by Hollywood studios that influenced widespread adoption of the tool. Similarly, I've indicated the human uses of a light meter by drawing upon ethnographic work such as interviews and written accounts of production to show how practitioners engage with the technology. I've also attempted to expand these approaches to include consideration of the material qualities and implications of the technology.

In discussion of the contrasting theoretical discourse earlier in this chapter I argued for the importance of social-oriented considerations that seek to understand technology through practical functionality and the cultural implications of its development. Following this, I outlined how a vitalist perspective which considers the unique characteristics of technology independent of its human instrumentation can offer an important understanding that compliments the social. Finally, drawing upon actor-network theory I argue that a combination of these approaches, which considers the distribution of agency across both human and non-human factors, can

offer a more comprehensive view of cinematography technology than presented by previous studies in the field.

The perspective I have outlined in this chapter provides a critical framework for the discussion of technology in lighting which, during my introduction to this thesis, I suggested was lacking amongst previous studies. As I have discussed, key texts in the field, primarily Keating's *Cinematography Behind the Silver Screen* (2010) and Salt's *Film Style and Technology* (2009), frame the development of cinematography technology in relation to stylistic considerations and the impact for film aesthetics. While this is an important consideration, it proposes a hierarchical understanding of techniques as subservient to social functionality. In this chapter, I have outlined and applied a wider approach to technology to understand the incident light meter - a tool that many argue is crucial for practical lighting processes. In so doing I have indicated how the relational perspective proposed by actor-network theory might be used to understand cinematography technology and have shown that social-constructivist and vitalist perspectives on the practice are in fact complimentary as they inherently relate and depend upon one another.

## Chapter 6: Conclusion

This thesis is one of the first investigations into moving image practice, and specifically the discipline of cinematography, to employ non-representational, new materialist theory.<sup>26</sup> The research questions that have guided this enquiry were born out of a desire to understand better and account for the many, evocative and creative ways that lighting can be used on screen. As a practitioner, approaching these questions through a hands-on investigation led me to develop a new strand of practical work, which now sits alongside and compliments my pre-existing collaborative cinematography practices.

The contribution offered through this combined portfolio of practice and written thesis is ultimately a reimagining of the role of the cinematographer in which the consideration of light as material expands the discipline across a nexus of technologies and production arenas. This perspective enables previously disparate and isolated production roles to be bridged, in the spirit conveyed by my installation *From Light & Shadows* (2016) and the accompanying *Screenworks* publication entitled *Virtual Illumination* (2016). It also affords greater recognition of the complex technological entanglements surrounding the production of moving imagery as addressed in my installations *Piccadilly Circus* (2015) and *#Life\_Drawing* (2017).<sup>27</sup>

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<sup>26</sup> Extensive searches through collections in the UWE Bristol Library and British Library including the EThOS and ProQuest thesis databases returned no other research considering cinematography practice though a new-materialist theoretical framework.

<sup>27</sup> These projects are discussed further in the accompanying exhibition catalogue, pp.15-46.

Most significantly, this research contributes to the sub-fields of cinematography and studies of moving image production, providing narrativised autoethnographic inspiration for future cinematographers while creating new understandings about how practitioners orchestrating light can approach and conduct their work. As I will outline further, the research methodology and consideration of lighting that I have developed also exists in dialogue with artists' film and video, including expanded cinema, and more generally the burgeoning field of practice-as-research.

This opportunity to conduct practice-led research allowed me to scrutinise my lighting processes as a cinematographer and investigate how I work through rigorous introspective investigation. Although this autoethnographic process has significantly developed my creative insight and vocational aptitude in the craft of cinematography significantly, I realised early on that the constraints of collaborative practice, such as the fast working pace and the script-oriented nature of many of the film projects I have been offered, meant it would not always be possible to bend a production to my research agenda. As such, the portfolio of practice includes only a fragment of the most relevant and well-documented films I've been involved with as a cinematographer during this research.

A deepening appreciation of the need for more self-authored work to address my research questions adequately led me to pursue a new diaristic, experimental and essayistic strand of practice. The aforementioned installations that evolved out of this enabled me to interrogate light *in* and *of* moving imagery directly through targeted, practical exploration, as I will discuss more thoroughly later in this

conclusion. Hence, all of the practical artefacts included in the accompanying portfolio are part of the investigation into the following questions as outlined in the introduction of this thesis, in which my practice acted as both a site, or field, of investigation in the autoethnographic sense, and also as the embodiment of my developing understanding of lighting:

1. What is the role of lighting as a creative and cultural process in moving image production?
2. How does technology inform a practitioner's lighting process in moving image production?
3. How can practical investigations contribute to new understandings of moving image lighting?

### **6.1. Lighting as a Creative and Cultural Process**

The research conducted for this doctorate has been presented across three core chapters, each of which offers a partial response to these questions while contributing to an overall, scaffolded, depiction of my research journey. The first section of this thesis entitled *Light and/as Material* (pp.45-77) introduced the notion of performative materiality, suggesting that lighting can be considered through this new materialist idea as having a particular character or quality which is utilised and moulded during production processes. Drawing a comparison between this active characteristic of light and Tim Ingold's (2013) notion of correspondence, I argued that moving image practitioners orchestrate light in a similar manner to the materials employed in craft disciplines.

Capturing the diaristic, personal imagery that constitutes my *iPhone Collage* (2014-17)<sup>28</sup> installation occurred alongside theoretical development and ultimately informed this underlying perspective of light. Across the four years of research, my understanding of the behaviours and aesthetic qualities of light has developed through sustained attempts at capturing ephemeral and wondrous instances of luminous matter that permeate the visible world. Shifting my practice away from a controlled arrangement of artificial sources in the context of collaborative cinematography to this more meditative, responsive and open-ended approach to depicting light on screen required me to adopt a new conceptual framework. *Light and/as Material* offers an insight into this reorientation, establishing the aforementioned perspective of light in terms of performative materiality, which situates the cinematographer as a practitioner thinking through material, implicated in the formation of moving imagery through its light-based realisation rather than standing removed or separate to these capture and display processes. The new habits of waiting, noticing and interpreting light formed during diaristic practical endeavours contributed to my understanding and drove me to forge this account of moving image practice, which recognises the symbiotic relationship between practitioner, material and light. This process also benefited subsequent collaborative cinematography work by providing points of aesthetic inspiration and expanding my repertoire of lighting based on the incidental formations of luminous matter that I've been studying. Instances of this can be seen in several of the more expressive shots

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<sup>28</sup> See exhibition catalogue, pp.21-24.

of light shimmering on the sea in *Not Waving* (2015)<sup>29</sup> or occasional reflections permeating across the frame in *Hôtel de la Comète* (2017).<sup>30</sup>

Building on this, the chapter entitled *Sculpting Light* (pp.77-120) situates the reader in the midst of lighting processes, tackling practical forms of knowledge derived from production experiences and revealing an entangled combination of the practitioner's creative intent, his/her immediate environment and the technologies employed, as implicit in lighting. Through this approach, the research contributes to the sub-field of cinematography most directly by questioning the dominant three-point lighting doctrine that is the conventional starting point and/or introductory approach for lighting work in the context of traditional moving image production. To achieve this re-orientation, *Sculpting Light* highlights the utilitarianism and technological dependence of the three-point approach through its roots in a standardisation of lighting codified by Hollywood studio era films. My desire for the research to speak directly to those working in the field underpins this chapter, which offers a grounded and pragmatic insight into some of the varied ways that a practitioner might approach his/her use of light.

The argument in this chapter is formed through an intersection of autoethnographic experiences lighting the short films *Life in Body* (2015), *Not Waving* (2015) and *Hôtel de la Comète* (2017)<sup>31</sup> alongside previously published accounts of creative lighting from active practitioners. Reading these sources through James Gibson's (1986)

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<sup>29</sup> See exhibition catalogue, pp.48-53.

<sup>30</sup> See exhibition catalogue, pp.60-65.

<sup>31</sup> These projects are discussed further in the accompanying exhibition catalogue, pp.47-65.



notion of affordances, I identified three new concepts that represent a more versatile way of discussing lighting and recognise the situated, distributed nature of creative lighting work. This shift from the three 'points' of lighting to the three concepts of *organisation*, *correspondence* and *association*, is indicative of the wider contribution of this research, which seeks more a nuanced, relational perspective on lighting. In essence, these concepts evolved as a way of understanding light as flow and energy in relation to collaborative practices, providing an alternative conception for practitioners within the confines of traditional cinematographic work. Rather than focusing on arrangements of equipment based on their technical capabilities, a concept-oriented perspective encourages the practitioner to listen and respond to different textures, qualities and features of light.

Recognising the creative potential in the newly discovered practical arena of expanded cinema I was exploring, *Sculpting Light* also extends this aforementioned understanding of production lighting into a more comprehensive framework which examines the ontological consideration of light as constitutive of moving imagery. This tussle between aesthetic light *within an image* and passages of light *conveying the image* was present in my first experimental work *Camera/Projector* (2014)<sup>32</sup> and continued as a line of practical enquiry throughout the installation projects, particularly in *From Light & Shadows* (2016)<sup>33</sup>, which explores the staged nature of artificial lighting in aesthetic mimicry of the passage of daylight through a window, projected onto translucent screens. Applying this idea of a practitioner's

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<sup>32</sup> See exhibition catalogue, pp.16-20.

<sup>33</sup> See exhibition catalogue, pp.32-39.

correspondence with illumination through to the exhibition and projection of moving imagery allowed me to discuss the expanded uses of light in artists' film and video works. These installation projects, along with the concluding passages of *Sculpting Light*, demonstrate the process-oriented nature of lighting from the point of capture through to the display of moving imagery and also highlight the relevance of this understanding beyond conventional collaborative cinematography.

## **6.2. Technological Factors in Lighting**

At the outset of this thesis, I highlighted how the sub-field of cinematography relied too heavily on the remediation of approaches developed during an era of photochemical processes such as the predominant three-point lighting approach. I also argued that academic texts on lighting in moving image production lack the critical understanding of technology to fully explain fully how practitioners work with and think through their equipment. Following this, the chapter entitled *Technologies of Light* (pp.120-180) represents the culmination of my investigation into lighting technology and considers how production tools are implicated in practice. This section of the thesis uses a perspective on technology outlined in the work of Michel Callon (1986), Bruno Latour (1996) and John Law (2008) to situate the practitioner in the midst of an entangled network of forces. It recognises the complex web of agency spreading across human and non-human actants which, as a whole, defines moving image practices.

During the course of this research, I was involved with numerous productions in the role of cinematographer. My autoethnographic instigation of these experiences - and particularly across the short films *Hôtel de la Comète* (2017), *Not Waving* (2015) and *Life in Body* (2015)<sup>34</sup> – reinforced the notion that creative and social parameters of each project also impact lighting processes in equal, if not greater, measure to the specific technologies employed. As such, my investigation has depicted and offered an understanding of exactly how I worked with and thought through equipment to enact lighting ideas during moving image production. *Technologies of Light* investigates the relevant discourses surrounding technology and considers each perspective in relation to these lighting experiences. This chapter outlines my search for an appropriate theoretical framework and a way to conceive of technology which could explain the everyday interactions I was analysing during my autoethnographic work. It ultimately depicts a struggle to attribute agency, either to the practitioner or the equipment itself, during lighting processes and ultimately employs the aforementioned actor-network theory as a method to reconcile these two perspectives, thereby offering a more comprehensive understanding of cinematographic technology.

Underpinning these written arguments, investigation into the technical systems of moving image capture and display has been a frequent theme amongst my installation projects, and particularly in *Piccadilly Circus* (2015)<sup>35</sup> and *#Life\_Drawing* (2017)<sup>36</sup>, which both utilise novel combinations of analogue and digital formats

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<sup>34</sup> These projects are discussed further in the accompanying exhibition catalogue, pp.47-65.

<sup>35</sup> See exhibition catalogue, pp.25-31.

<sup>36</sup> See exhibition catalogue, pp.40-46.

within the same aesthetic frame to question notions of medium specificity. Moreover, *#Life\_Drawing* (2017) took this line of enquiry further, exploring the nature of agency in the technological systems themselves, which constitute an increasingly crowded digital landscape and afford the ubiquitous circulation of imagery. This installation incorporated social media data from the online platform Instagram, continuously searching for new posts with specific hashtags to trigger multiple projectors. Practical engagement across formats in this way contributed to my understanding that each tool enables a unique set of operations, leading the writing in *Technologies of Light* to explore and depict the production process in a way that could encompass vitalist accounts alongside social constructivist accounts. While this perspective of technology is discussed predominantly in relation to the sub-field of cinematography and studies of collaborative filmmaking, perhaps the most equipment-intensive areas of moving image production, it also has relevance to broader creative communities and, as my installation work attests, specifically for independent artists working with film or video.

The recognition of technological complexity inherent in moving imagery as argued in *Technologies of Light* also breaks away from established ways of considering production lighting processes. At a moment of increasing technological change, this perspective instead emphasises the creative aspects of the control of lighting rather than approaching the practice through particular arrangements of equipment. The notion of affordances outlined in *Sculpting Light* is crucial to this argument in understanding the combination of an environment and intent of the practitioner, as well as the characteristics of tools available to them, which together result in the

lighting potentialities for any given production. By discussing lighting in these creative terms, informed by practice, this combined practical portfolio and thesis offers an insight into how practitioners might recognise and understand the involved, loaded, nature of their production tools. In conjunction with this, my research findings expand the vocabulary of lighting to a more creative realm, offering a way for practitioners to adapt across the ever-shifting landscape of technologies rather than relying upon ostensibly outmoded uses of analogue techniques.

### **6.3. Practice and Autoethnography**

Throughout this thesis, autoethnographic passages have been interspersed between more formal discussions of lighting processes in a creative writing approach inspired by Carol Rambo Ronai's (1995) notion of the layered account. The resulting core chapters offer a synthesis between: practical insight captured in note form and later narrativised; contextual insight from the academic fields that surround or exist in association with cinematography; and theoretical insight through discourse analysis of a particular set of ideas in relation to each aspect of lighting. I arrived at autoethnography through a desire to inform the written thesis component of this research with aspects of the creativity that was prevalent in my practical endeavours. As each chapter demonstrates, this method enables the thesis to embody my experiences during production (or at least an account of them) and therefore situates practical work at the centre of the research. Switching voices in this layered approach not only serves to foreground my first-hand experiences but also ties together the two components of thesis and portfolio that comprise this research, forming a series

of pathways between theoretical and practical understandings of lighting that indicates their intertwined nature.

As outlined in the *Methodology* (pp.28-45) section of this thesis, autoethnography was a key research method which enabled me to gather evidence during production activities, mainly through voice recordings which describe some of the practical insight and creative challenges I experienced when working with light during each project. Applying autoethnographic techniques within a practice-research enquiry in this way enables the practitioner to achieve a more objective and reflexive understanding of their work. During the course of this doctoral research I've found this method beneficial, not only for providing evidence which can be analysed to support and structure assertions, but also because it contributes directly to my growth as a practitioner. Systematically recording and studying creative decision making through autoethnography has required me to consider practical work in new ways. This additional process of self-reflection has furthered my practical understanding of cinematography and encouraged me to adopt new production approaches.

Overall, I hope this combined portfolio of practice and written thesis will contribute to knowledge and understanding in several ways. First, by demonstrating the importance of creative and poetic aspects of lighting in moving image production, understood through a relational, new-materialist, notion of the flow and energy of light as a generative force. Second, by providing a more detailed first-hand investigation into lighting processes than is currently available, capturing some of the

practical knowledge implicit in moving image production through autoethnographic methods and layered writing within the thesis. Third, by applying the actor-network theory framework to moving image technologies and through so doing, offering a new approach to the relationship between a cinematographer and his/her equipment. My hope is that this research will be taken up by scholars studying the production of moving imagery as well as practitioners across interdisciplinary backgrounds who are actively exploring illumination themselves, thereby helping to further creative uses of light within and beyond moving imagery.

#### **6.4. Future Directions**

For the practicing cinematographer, the benefit of a new-materialist perspective on lighting and relational understanding of technology as outlined in this thesis is manifold. As I have shown in *Sculpting Light*, this perspective gives rise to an alternative approach, outlined through the concepts of *organisation*, *correspondence* and *association*, which can directly assist the practitioner in planning and executing their lighting work. I have distinguished between the light *of* as opposed to *within* an image and through doing so argued that lighting is a process which extends through to the display of moving imagery. With the advent of digital technologies, aesthetic decisions that would traditionally lie within the responsibilities of the Director of Photography are occurring more frequently in post-production rather than on the film's location or set. At the time of writing, the future relevance of this role is being widely debated so the new-materialist perspective on the discipline offered in this thesis could contribute to such discussion. During the

International Cinematography Summit Conference in 2011 for example, societies representing active practitioners across the world issued a joint statement proposing that “we, as cinematographers are the custodians of the image. This is our heritage and our responsibility”. The recognition of technological entanglement described in *Technologies of Light* relates directly to this notion of the practitioner as custodian, providing a new theoretical framework to better understand how cinematographers are engaged in practices that combine aesthetic decisions with a range of diverse and creatively implicated equipment or formats.

The research that I’ve outlined has laid the foundations for a line of investigation that could stretch much further into my future as an academic practitioner, provoking new questions that I intend to pursue through ongoing scholarly practice-research. One of the most exciting outcomes of this process has been developing a new strand of self-authored experimental work. This practice enables exploration of more specific and adventurous configurations of moving image lighting, which might otherwise have remained undiscovered in my collaborative cinematography endeavours. To work within a gallery environment rather than a traditional cinema environment and orchestrate the relationship between audience and frame, thereby considering passages of light directly, has opened a new form of creative expression that I’m keen to utilise further through additional installation projects. Although this research has been informed by artistic experimentation with projected light, there is a wide array of installations using other forms of illumination in the context of gallery-based and site-specific work that I have only been able to touch upon



tangentially and which would warrant further enquiries that are beyond the scope of this doctoral project.

At the time of writing I am preparing for a faculty position in the School of Cinema at San Francisco State University where my primary responsibilities will be teaching cinematography and contributing to the school's production curriculum. As such, pedagogical implications for cinematography practitioners will be a key application of this research. By way of example, the argument put forward in *Sculpting Light* is ingrained in my syllabus for an elective course entitled Cinematography Workshop that is available to students of the school's Master of Fine Arts cinema degree. The course introduces the concepts of *organisation*, *correspondence* and *association* that I outlined as an alternative to three-point lighting. This process-oriented approach is taught through an emphasis on creative experimentation in visual storytelling alongside analysis of the aesthetic and sensual qualities of light rather than relying on technical instruction about equipment.

There is a great deal of impact potential for this research outside of the academic environment through exposure to and collaboration with film industry manufacturers, specifically those producing lighting equipment, and through knowledge exchange activities involving other practicing cinematographers. Industry trade shows and film festivals will be key arenas to present some of the ideas put forward by this research. Through doing so, I hope to foster discourse that can perhaps adapt more versatile lighting technologies in response to the new-materialist approach I've outlined. Equally, discussing this work with active

cinematographers will help to refine my future research agenda and could encourage them to expand the ways they approach creative lighting work in consideration of a relational understanding of the discipline.

Additionally, the new-materialist perspective on lighting and research methods developed during this doctoral enquiry is well suited to a range of focused practice-research studies about new arenas of moving image production. I've argued that, during a time when digital capture and display technologies are increasingly proliferated, the unique lighting considerations presented by emerging formats require attentive first-hand investigation. Amid this digitisation, the burgeoning field of virtual cinematography is a key area for further exploration. For instance, my installation project *From Light & Shadows* (2016)<sup>37</sup>, and the accompanying publication entitled *Virtual Illumination* (2016) in *Screenworks*, highlights a grammatisation of light in digital environments. As filmmaking routinely incorporates more imagery that is digitally generated or manipulated, this research indicates the value of understanding alternative environments such as the virtual space of rendering software in relation to physical live-action lighting processes. With the advent of real-time graphics engines and light-field capture technologies moving aesthetic image decisions into the realm of post-production, the impact of algorithmic approximations of light will have significant cultural implications and requires further investigation.

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<sup>37</sup> See exhibition catalogue, pp.32-39.

Emerging technologies such as virtual reality (VR) and augmented reality (AR) often employ spherical 360-degree image capture which challenges conventional cinematic approaches to lighting. The camera's entire surroundings are visible during this form of production so lighting fixtures must be hidden or incorporated within the shooting environment or painted out using post-production masking techniques. Hence, this new immersive form of moving imagery calls for another reconsideration of the grammar of lighting and raises new questions about the relationship between a viewer and light. In addition to this, the increasing prevalence of High Dynamic Range (HDR) and Wide Colour Gamut (WCG) display technologies offer cinematography practitioners an expanded pallet of brightness and colour through which to convey their work. The repercussions of these changes have yet to be studied in detail but an increased brightness range for example could enable cinematographers to expand their lighting contrast ratios during production to adapt to the new light values available to the audience, while the greater breadth of display colour combined with recent improvements to light emitting diode (LED) lighting fixtures could invite more experimentation with and use of nuanced hues and saturation.

These technologies and other imminent variations of moving imagery provide new areas for investigation that will be of interest to the academy and industry alike as they become more widely employed as forms of cultural production. The new-materialist perspective on lighting that I have outlined is a strong foundation for studying these emerging forms of virtual and interactive cinematography because of its emphasis on process and a practitioner's correspondence with light. The

conceptual approach to lighting that I have put forward through the terms *organisation*, *correspondence* and *association* provides an effective way to understand and analyse the creative work of practitioners across changing technologies. As this doctoral enquiry has argued, light is an intrinsic and potentially expressive aspect of moving imagery regardless of the shape, form and resolution that specific capture and display devices might take in future.

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