2021

A Relational Ecology of Photographic Practices: Towards a Non-anthropocentric Approach to Photography

Knight, Jacqueline

http://hdl.handle.net/10026.1/17157

http://dx.doi.org/10.24382/1043
University of Plymouth

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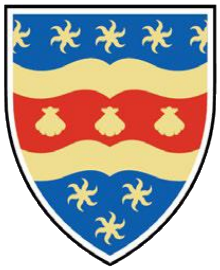

UNIVERSITY OF
PLYMOUTH

A Relational Ecology of Photographic Practices: Towards a Non-anthropocentric Approach to Photography

by

JACQUELINE LOUISE KNIGHT

A thesis submitted to the University of Plymouth in partial fulfilment for the degree of

DOCTOR OF PHILOSOPHY

School of Art, Design, and Architecture
University of Plymouth

April 2020

Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Doctoral College Quality Sub-Committee.

Work submitted for this research degree at the University of Plymouth has not formed part of any other degree either at the University of Plymouth or at another establishment.

This study was financed with the aid of a studentship from the Plymouth University
A programme of advanced study was undertaken, as part of *CogNovo: Creativity and Cognitive Innovation* an Innovative Doctoral Programme, funded by the EU Marie Skłodowska Curie initiative

The following external institutions were visited for consultation purposes:

Eye Filmmuseum, Amsterdam
Nederlands Fotomuseum, Rotterdam

Selected publications and conference presentations

Publications

Nasser, M., Peres, N., Knight, et al. (2020) Designing clinical trials for future space missions as a pathway to changing how clinical trials are conducted on Earth. *Journal of Evidence-Based Medicine,* 13(2), pp.153-160. https://doi.org/10.1111/jebm.12391

Knight, J. and Perres, N. (2018) TAaCT: Technology, Affect and Clinical Training. Transtechnology Research Open Access Papers. https://pearl.plymouth.ac.uk/handle/10026.1/17117

Knight, J. (2017). A Relational Ecology of Photographic Practices. [Special Issue]. AVANT, 8, pp.285–293. https://doi.org/10.26913/80s02017.0111.0026

Presentations at conferences:

Knight, J. (2018) Media Tactics and Engagement. NECS (European Network for Cinema and Media Studies. University of Amsterdam. 27- 29th June 2018. Paper: A New Materialist Ontology of Photography.

Knight, J. (2017) Off the Lip: Collaborative Approaches to Cognitive Innovation. University of Plymouth. 16-18th August 2017. Paper A Relational Ecology of Photographic Practices.

Knight, J. (2017) Sensibility and the Senses; Media, Bodies, Practices. NECS (European Network for Cinema and Media Studies. Université Sorbonne Nouvelle, Paris. 29th June – 1st July 2017. Paper: An Ecology of Photographic Practices Towards an Aesthetic of the Posthuman.

Knight, J. (2017) Ways of Machine Seeing. Cambridge Digital Humanities Network, CoDE (Cultures of the Digital Economy Research Institute) and Cambridge Big Data. University of Cambridge. 26-28th June 2017. Paper: A Relational Ecology of Photographic Practices.

Knight, J. (2017) Creative Encounters with Science and Technology: Legacies, Imaginaries and Futures. Kochi-Muziris Biennale, Kochi, India. 18-19th February 2017. Paper: An Ecology of Photographic Practices Towards an Aesthetic of the Posthuman.

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Film Screenings

2018 Knight, J. (2017). *The Bell Ringers.* [16mm film] Screened at L'Etna Atelier de Cinéma Experimental, Paris. 1st March 2018.

2018 Knight, J. (2017). *The Bell Ringers.* [16mm film] Screened at The Experimental Frame, Hands on Film Lab, Newcastle upon Tyne. 14th December 2017.

2017 Knight, J. (2017). *The Bell Ringers.* [16mm film] Screened at Allerdale Film Farm, Aspatria, Cumbria. 31st August 2017.

2017 Knight, J. (2017). *Aquarium.* [16mm film] commissioned by BBC Love to Read Campaign, screened at Future Imperfect Symposium, Plymouth University. 1st April 2017.

2016 Knight, J. (2015). *Knots.* [video]. Omgyjer Glusek, Peckham24 moving image programme, South Kiosk. London.

2015 Knight, J. (2015). *Knots.* [video]. Screening for Love Short Films (BFI LOVE Series) at Cornwall Film Festival, 25th Nov 2015.

Curating and Co-ordinating

2019 *HeArts Hospital Arts Program*, Torbay and South Devon NHS Foundation Trust. April 2018 – May 2019. Gallery Launch 5th February 2019.

2017 *Ojoboca & Matt Davies:* 16mm projection performances. Union Corner, Plymouth. 10th March 2017. http://www.cinestar.org.uk/ojoboca--matt-davies.html.

2016 *Side by Side* in partnership with LUX, Back Lane West, Cornwall. 4th April 2016 http://www.cinestar.org.uk/lux-side-by-side.html.

2015 *Cinestar Artists' Film Programme* [film screening] Cornwall Film Festival. 14-16th November 2015 http://www.cinestar.org.uk/cinestar-artists-film-programme.html.

2015 *Photochemical: handmade 8mm/16mm films from artist-run, DIY moving image labs in Europe,* [film screening] Cornwall Film Festival. 14th November 2015 http://www.cinestar.org.uk/photo-chemical-screening.html.

2013 *16mm Artists' Film Screening:* in partnership with James Holcombe, no.w.here [film screening] St Ives 27th September 2013 http://www.cinestar.org.uk/16mm-artists-film-screening.html.

Word count of main body of thesis: 67,304

Signed: J Knight

Date: 7th April 2020

Acknowledgements

The creation of this thesis has been a distributed cognitive process. I would like to give my fullest gratitude to Prof. Dr Michael Punt for endlessly enriching conversations, weaving thicker more unwieldy threads into this thesis. I have been extremely lucky for his unwavering dedication, patience and perhaps more important, his encouragement to forge ideas and approaches that lay outside the mainstream. Special thanks to my supervisory team Dr Hannah Drayson, with her critical eye and witty, astute commentary that somehow made track changes entertaining and to Dr Martha Blassnigg, who left us too soon, but her influence is imprinted here in this thesis in matter and spirit.

With gratitude to my extended team and mentors Mark Paul Meyer Senior Curator at the Eye Filmmuseum, Ruud Visschedijk director of Nederlands Fotomuseum and Prof. Susan Collins at the Slade School of Fine Art who connected me with their colleagues in order to gain access to particular private and institutional archives. Acknowledgements of indebtedness also go to David Hurn and John Hilliard who opened their home and personal archives to me, offering valuable insights about their working process. I would like to note that many of the contact sheets within this thesis are unpublished materials from their archives, including original contact sheets belonging to Magnum photographers which were kindly re-photographed for this research by David Hurn.

Completing this work would have been all the more difficult were it not for the ongoing encouragement and unconditional love and support of my family, friends and particularly my son. I hope he will feel as proud of me, as I was of him graduating with a first three years ago. Special thanks also go to Jane Hutchinson, Joanna Griffin, and Davina Kirkpatrick for their critical eye and invaluable proofreading.

Finally, unacknowledgements go to the car thief in Llandaff, Cardiff on 5th Dec 2017 who stole my computer and back-up drives, passport, reading glasses, makeup and gluten free snacks, and also to iCloud and their syncing glitch with Sierra, somewhere about a third of the way through Chapter 4. Unacknowledgements also go to Cardiff Met Police who showed not the slightest bit of interest in the CCTV material provided to them. It was after this time that the hypothesis on material evidence and the non-linear model of causality presented herein was conjectured.

Use of CCTV images comply with GDPR requirements and the Data Protection Act 2018 (DPA 2018).

Abstract

A Relational Ecology of Photographic Practices: Towards a Non-anthropocentric Approach to Photography.

Jacqueline Louise Knight

This thesis argues that as photography's technological basis has become more complex and increasingly detached from human vision, a thicker account of photographic practice that moves away from humanist discourse and single authorship can assist in demonstrating a continuity between film and new technological photographic practices. It revisits key concepts in documentary photography such as the 'decisive moment' through the filter of particular historical, technological and philosophical ideas that have informed the critical engagement with photography as a media of representation. It reconsiders some orthodox assumptions about photography including the idea that photography is fundamentally a human-centred practice and that photographic technology has a singular determining agency that is most often subordinated to the image. From this, the thesis attempts to factor in the material, cognitive and technical aspects that shape the photographic decision-making process as they can be observed in the relational network of elements that contribute to the final image. It then introduces new materialist theories that address non-human agencies and that have begun to force an awareness of the distribution of cognition and human action to the fore. Through a series of case studies and diffractive readings of contact sheets from professional photographic practice and production plans from a television broadcast, the collaborative relationship between the photographer, apparatus and world that co-produces the final image is made clear. This constructs a framework to understand photographic practice as a relational ecology that reveals the varying play of agencies in the collaborative meshwork between the photographer, the photographic apparatus and world during the photographic event. By emphasizing the mobility of the decision-making process in a way that helps towards an understanding of the dynamics of a collaboration it opens the way for a continuity between digital and analogue practices that do not bracket the cognitive processes of the photographer in favour of the non-human agents.

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Key terms

Agency: this term is used in this thesis in the same way that it is understood in new materialist theory. Object-Oriented-Ontology, Actor Network Theory and New Materialism insists that everything that exists – human and non-human – is an actant. Agency is therefore distributed amongst all things in varying measures at different times. Things are active not because they are imbued with agency but because of ways in which they are caught up in currents of a lifeworld. The properties of actants then, are not fixed but are processual and relational. Agency within feminist new materialisms is positioned as, not just a methodological critical tool that acknowledges its own set of relations, but as an ethical modality with which practitioners can be attendant to the political generated by the entanglement of matter.

Affect: deriving from the Latin *afficere,* the word affect implies passivity, in that it means 'to have something done to one'. this term refers to the philosophical notion of affect from taken from Affect Studies as aligned to the humanities (Massumi, 2002; Henri Bergson, 1908; Gilles Deleuze and Félix Guattari, 1984, 1988) The general agreement is that affect encompasses the various capacities of bodies to affect and be affected, and it therefore refers to forces and intensities that are visceral (Chichosz, 2014, p.56) Affect Studies understands *affect* as the visceral forces beneath, alongside, or generally other than conscious knowing that can serve to drive us toward movement, thought, and ever-changing forms of relation (Gregg & Seigworth, 2010, p.8). In Material Culture Studies, the affective potentialities of objects and materials in relation to creativity are discussed in archaeology and anthropology (Gibson, 2013; Jansen 2013; 2015; Malafouris 2013). It is recognised that affective 'energies' of an active and responsive material world impacting on the body of the artist or maker as they move and create – a body that is immersed in an

active and responsive environment – orientates action and is persuasive in goal orientated practices.

Analogue / Film photography: refers to the process in which a film camera that uses a physical, non-electronic recording medium (e.g., photographic film or plate), where light is captured by sensitive silver particles (within a photosensitive emulsion) and recorded as a latent image, is then subjected to chemical photographic processing, making an image visible. This thesis may interchange the terms film and analogue but is aware that the term analogue is a misnomer for film photography. Film was never called analogue until digital cameras came into existence, since then this term is used frequently in academic theory to refer to the photo chemical process where the plastic-based film creates an 'analogue' of a scene. This term is technically incorrect as analogue describes an instrument whose output is the continuous function of time, which has a constant relation to the input. Neither film nor film cameras are analogue in this way.[1]

Apparatus: is used in the Flusserian sense of the word in relation to understanding the black-boxed complexity of interactions and the invisible workers that realise the photographic event. The photographic apparatus operates in ways that are not immediately known or shaped by its operator. The apparatuses game consists of combinations of symbols contained in its program; while fully automated apparatuses have no need of human intervention, many apparatuses require humans as players and functionaries. The term can also be understood more broadly through Agamben (2009) as "literally anything that has in some way the capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviours, opinions, or discourses of living beings." (p.14).

1 For a detailed discussion of the differences between analogue and digital processes see T. Binkley, 'Reconfiguring culture' in P. Hayward and T. Wollen, Future Visions: new technologies of the screen, London: BFI (1993).

Dispositif: this concept arose in the 1970s appearing first within cinema studies where the ideological impact of cinema's *dispositif* and the specific 'cinema-effects' it has on the spectator is analysed through cinema's *dispositif* – defined as a particular set of technologies (the camera, celluloid, photographic registration, projector, etc.) and conditions of projection (the darkened room, hidden projector, light from the projector hitting a screen, immobile spectator, etc.). Cinema's *dispositif* has a material component which examines the basic apparatus, but also psychological, spectatorial and ideological aspects which reinforce the spectator's desire for illusion and prove to be responsible for producing an impression of reality. This concept has much currency in cinema studies, but photographic theory does not have an equivalent. The term is used in this thesis to materially examine the basic apparatus.

Non-anthropocentric: this term is used in this thesis to mean a 'decentring' of the anthropocentric. It refers to the way humans are placed on equal ontological footing with other objects. For posthumanist theorists, anthropocentric views are inherently flawed when thinking or talking about technological agency, not only because agency is not a discrete entity, but because some agencies are not human.

Non-human: this term describes all that is other-than-human; creatures, animals, critters, organisms, plants, actants, objects and powers that have agencies in their own right. In Jane Bennet's view non-human entities (including inorganic matter) are composed of 'vibrant matter'. This also includes matter that we might consider 'dead' such as fossils and stones that are not actually dead but are very much alive and constituted by a lively and energetic play of forces.

Posthumanism: this term is understood from the perspective of the humanities and refers to a range of concerns, from a questioning of the centrality and exceptionalism of humans

as actors on this planet, or the relationship to other inhabitants of the earth, to a re-evaluation of the role of objects and space in relation to human thought and action, or the extension of human thinking and capacity through various forms of human enhancement. Posthumanist thought thus questions the boundaries between what is seen as inside and outside, asking where thinking occurs, and what role a supposedly exterior world may play in cognition. Key theorists in this field include Rosi Braidotti (2013), Karen Barad (2007) and Jane Bennett (2010) and N. Katherine Hayles (1999).

Program: Alongside Flusser's discussion of 'apparatus' one also encounters descriptions of 'programs' and thus the question emerges as to the source of these 'programs.' Flusser credits the programmers with performing an integral role in the advancement of the "apparatus" and with being the people at the forefront of disseminating the ideology that treats humans as being reducible to objects to be enumerated, manipulated, and even eliminated. And while their positions of authority may make the programmers seem as though they are in control, Flusser highlights that the programmers are every bit as incorporated into "apparatus"

World: this term is used in this thesis in the same way that it is used in the Material Culture literature. It does not refer to a geographical or planetary feature but is used to signify a version of reality that is an undifferentiated entity of intertwined matter and energies.

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Introduction: A Relational Ecology of Photographic Practices

"The Red Wheelbarrow"

so much depends
upon

a red wheel
barrow

glazed with rain
water

beside the white
chickens.

– William Carlos Williams first published in 1923.

One of the most visually memorable poems written, *The Red Wheelbarrow* by William Carlos Williams (1923) eloquently demonstrates how the relationship of one object next to another changes its appearance and our perception of those things, a kind of organism, a subject that interacts and speaks to us. This poem is considered a prime example of early twentieth-century Imagism – a movement in early 20th-century Anglo-American poetry that favoured the precision of imagery and clear, sharp language (Hughes, 1972).

The poem is made of four stanzas and clever use of line-breaks and words, and "so much depends", in this poem, on the splitting of the two compound words, "wheelbarrow" and "rainwater". These dissections slow the reader down and help the mind's eye to register more vividly the individual wheels as well as the body of the barrow, the water that is more than raindrops. Important for their spatial emphases are the prepositions "upon" and "beside", two small words that the poem magnifies hugely yet their implications resonate beyond the phrases that contain them. The abstract "so much" depends upon the objects, but the rainwater also depends physically upon the barrow, the glazing effect depends upon the rainwater and the radiant whiteness of the chickens depends upon the effects of both the rainwater on the redness of the barrow. The idea of the barrow being "beside" the

chickens is complex: the barrow is stationary while the chickens are likely to be moving about. If they are not specially posed, their aesthetic effect is of sheer lucky chance. Much like a snapshot, the effect is seized from the flux of existence.

The Red Wheelbarrow evades what it seems to invite: a simple, visual interpretation. Much like how we experience photography, the poem's meaning and its vivacity only makes sense because the reader is not only visualising the discrete objects, or depicted subjects, we are simultaneously visualising the affective space between them. The vague, casual beginning, "so much depends", points to the contingent, affective relationships between all the objects where they are transformed by their interrelation to one another and read as a connected meshwork. As anthropologist Tim Ingold observes in relation to environmental perception and skilled practice "action is not so much the result of an agency that is distributed around the network from node to node, but emerges from the interplay of forces that are conducted along the lines of the meshwork" (Ingold, as cited in Knappett & Malafouris, 2008, p. 212). In a meshwork it is the entangled relationships that are more important than the transportation of heterogeneous bits of information from node to node. Ingold's work points to the nature of creativity as the continual unfolding of relations and processes in a world that is itself in motion that give rise to creative artefacts.

Adopting Ingold's idea of an entangled meshwork, this thesis repositions the human within a relational practice in the account of what brings photographic artefacts into existence. It argues that doing so allows us to build a continuity between photography as it was practiced in the 19th and 20th century and its current multimodal forms. Further, it suggests that doing so can allow the discussion to avoid reductivist approaches such as technological determinism as well as the semiotics of cultural studies. The need to revisit the place of the human in the production of the photographic artefact is due, in part, to an increased ethical and political complexity in technology and our relationship to it. Moreover, there has been

a perceived acceleration in the rate of technological change that has started to distance the photographer from the camera apparatus, the beginning of this shift in visual culture was noticed when manufacturers steadily began to abandon the camera viewfinder in favour of an LCD screen. At the cusp of a landscape shift from photochemical to digital forms of photographic image-making practice, a number of commentators (McLuhan 1964; Neuman 1991; Lister 1995; Manovich 2001) noticed that there was a transformation in the temporal process of the practice associated with this. According to some of these thinkers (Cubitt, 2014; Stojković, 2018; Blaagaard, 2015) this technological change had the effect of reconfiguring the processes of production, distribution and reception of photographic images within an already shifting image economy. The means of digital production of images also became the same means by which they were distributed; scanned, edited and received through the computer screen or digital print. The thesis takes the view that whilst it is well recognised that digital photographic practices have collapsed time and space, and accelerated the photographic process, these new emerging digital technologies have also begun to distance the photographer from the physical, material and still poorly understood functions of the apparatus. It becomes apparent that in many other ways digital photographic practices physically attenuated the process, inhibiting the photographer from handling, and therefore experimenting, with the mechanics of the camera, to the point where many current technological image-making practices have displaced the body of the photographer from the apparatus altogether.

It has been twenty years since Harun Farocki made *Eye/Machine I (2000) 'Images without a social goal, not for edification, not for reflection,'* in which he examined the operational potential of images in fields from marketing to warfare, where human eyes were becoming anachronistic.[2] Since then we have become aware of how images are at once becoming

[2] Farocki's film visualises to human eyes how a machine is seeing by overlaying surveillance video footage with animated yellow arrows and green boxes to show how a machine calculates trajectories or recognises moving bodies and objects. Throughout his career, Farocki's method was to look into the dark

more powerful, and the means through which they're produced have become ever darker and hidden. The overwhelming majority of images are now made by machines for other machines, with humans rarely in the loop. As Paglen (2016) states "the advent of machine-to-machine seeing has been barely noticed at large, and poorly understood by those of us who've begun to notice the tectonic shift invisibly taking place before our very eyes" (n.p). A new landscape of invisible images and machine vision no longer depends on the human subject – the photographer, filmmaker or journalist – being present at all.

In the shift from analogue to digital technologies, came a shift favouring the image ahead of text as a communication tool. With images now being the fundamental unit of measurement, when people are not able to decipher these, their lives become a function of them, and society itself becomes the automation in which human beings live. Photography is not strictly a medium in the artistic sense; it also represents a communication system. With photographic images their use has become so instrumental to the mediation of their message that they no longer carry messages. Now, they are signifers without a signifed – they are ends in themselves so that it is people who function by media, not the other way around. In this light, establishing a philosophy of photography for the masses would also mean favouring a wider understanding of reality as well as finding a way to discern between information that is useful and information that is redundant. Thus, questions about the future posthuman condition arise and methods of counteracting its control develop. These concerns call for a recalibration of visual culture and media theories that have depended on the centrality of the human at the centre of vision – those which still assume that humans are generating and looking at images, and that the relationship between human viewers and images is the most important moment to analyse.

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and invisible places where images get made. Insisting on the material processes that construct images and the materiality of images themselves, Farocki entered the sound stages, editing rooms, post-production houses, and techno-military laboratories.

One of the key ways the gradual decentralisation of the photographer is addressed in this thesis is to examine what happens when the shifts between film and digital apparatus bring into focus a change in the cognitive approach of the photographer. Of course, this is an ongoing shift and also true working between formats and film gauges (i.e. 35mm, medium and large format film cameras), that for example vary potential of mobility through changes in camera size and its pre-set programs. However, a more accentuated difference is apparent between digital and film. There appears to be a distinct correlation between the possible number of exposures afforded and the acuity of attention, perception and response required in the moment of photographing. In contrast to digital photography, film photography is restrictive and unforgiving. Film photography requires highly concentrated attention, perception and prompt decision-making, which is not only imposed by the type of subject being photographed, but also by other technical factors such as the number of possible exposures. Digital photography requires a different way of acting in the field; still decisive, but using continuous shooting defers more acute decision making to the editing process. This thesis aims to open up a discussion of the effects of such a shift in the weight of agencies, particularly authorship, and the consequent explanations of causality when technologies change in ways that realign the work of the human.

Questions of agency and authorship have been present since the earliest stages of the development of photography. For example, an ontological claim regarding photography's status, is latent in the etymology of its name, a "notation in light". The apparent agency of light within the photographic medium was brought to attention by one of its inventors, Henry Fox Talbot. Epitomised by the title of his book *The Pencil of Nature* (1844). In his writing Talbot did not intend to eliminate the human agent, he sought instead to offer an alternative description to "the prevailing notion of the omnipotent creator who, with a stroke of his brush, translates his object of reference into an image possessing a certain

impact“ (Azoulay, 2015 p 12). Talbot’s description moved the emphasis away from the owner of the means of production and points to the potential latent in the capacity of the new technology to deviate from familiar forms of image production, which assumed a singular agency. In effect, Talbot was deflecting attention away from the authority of the human by claiming light as the author. This sentiment prevails into the late 20th century in experimental avant-garde film and artistic photographic practice. Embracing the agency of the apparatus, the properties of materials, and other environmental phenomena as a natural part of the working process, for many artists, served to orientate the direction of the work. Working with, and making central to their practice, the properties and dynamic agencies of light and matter preserve an apparent honesty for the integrity of the photographic image – described by the modernist’s as a ‘truth to materials’. Working in this way, the photographer is positioned as a conduit between the camera apparatus and the world and the resulting photograph is a manifestation of this mediation process. However, in most other photographic practices, particularly those that still aim to use photography as a form of documentation or representation, or at a greater extreme, as a truth-seeking device or to provide some evidential basis for an event, the agency of anything other than the photographer or operator is little discussed in theory, apart from anecdotally, in the production of the work.

The thesis moves between these extremes to explore the cognitive aspects of photographic practice, or image production practices, that insist on the collaboration between photographer, technology and world and to see how the impact of digitalisation has affected the work of the photographer. This meshwork is taken as a starting point to analyse the problematic theory of agency and free will in the cybernetic age in which we live. This discussion is sustained by interdisciplinary cognitive perspectives that understand human cognition as both ‘extended’ (Clark and Chalmers, 1998; Overman and Malafouris, 2017; Lucy Schuman, 2007) beyond the boundary of the human through tools, and

'distributed' (Merleau-Ponty, Hutchins, 1996; Ingold, 2010; Ihde, 1990; Knappett, 2005; Malafouris, 2013) across objects, individuals, artefacts, and tools in the environment. In particular, relational models of cognition 'in the wild' (Hutchins, 1996), 'cognitive ecologies' (Hutchins, 2010, 2014) and 'cognitive assemblages' (Hayles, 2017) that describe how our cognition is enmeshed with technical systems and those of other life-forms, resonate with my own experience of managing the multiple determinates and variables in the process of making photographs. A photographer's thinking and decision making utilises resources and networks of interacting agents and objects whose collaboration co-produces what the photographer could not realise alone. These perspectives call for a more accurate and encompassing understanding of photographic practice to enable humbler perceptions of human roles as we move toward a future in which we collectively decide to what extent technical autonomy should and will become increasingly intrinsic to human complex systems.

Unlike a technological history, this thesis asks what insights digital photography can bring to a retrospective understanding of the photographic process. Chapter two unpacks this through a close examination of Cartier-Bresson's 'Decisive Moment', arguing for a renewed understanding of intentionality in photography. It takes this to a close examination of a number of contact sheets and case studies taken from professional photography, which after dismantling and examining the photographic process show how all photographic artefacts are a manifestation of a collaboration between photographer, apparatus and the world. By arguing that the agency in the photographic process is variously distributed amongst all the actors, human and non-human, in this dynamic, the thesis proposes that all photography is to some extent non-human.

I come to this thesis from my practice as a photographer and filmmaker working primarily with medium format photography, 16mm film, and other digital audio-visual media.

Working in this way has allowed me to develop a heightened sensitivity to the materiality of these media through a close engagement with not only their technical processes, but also using the medium to critique itself. Engaging with photochemical film and camera technologies in a hands-on manner[3], has led me to a particular understanding of photography characterised by an awareness of the reciprocity of working with the human and non-human agents that constitute the photographic process; the limitations of material processes, the complex chemistry required to produce images and the technical infrastructure that develops and supports it.

As photographic practices changed to embrace digital technologies, for many, these technical concerns fell away and became a niche concern. Yet for those of us who maintained an interest in the technicalities of the photochemical photographic process and so preserve the material knowledge and technical understanding necessary for working and experimenting with the medium, these concerns did not disappear. This level of material engagement with the photographic process demands a recognition that photographs are material objects as well as images, their content is never separate from their materiality. This thesis takes as its starting point the transformation from film to digital in the early 1990s. This is one of many possible starting points, but it is used in this thesis for three main reasons: (i) At this time I began art school and had started using a range of camera formats and film gauges with more conviction about the appropriateness and persuasiveness of the medium in communicating content. It was through this exploration that I began to take a critical approach towards the medium, recognised the distinctive ways of working and thinking with different cameras and the specific agencies of the apparatus; (ii) the rapid developments in the digital industry radically transformed the

[3] In a time when there is increasingly limited support for photochemical film practices, through Cinestar, I have worked extensively with chemical development processes as well as contributing to a worldwide network of independent filmmakers that share practical knowledge (such as methods for creating recipes to develop film in cafenol, vitamin C and seaweed).

production, distribution and reception of photographic images. However, the discourses and critiques of these emerging digital imaging technologies were sparse and undeveloped. In the twenty-five-year history since, the discussions have remained largely fixated on contrasting film and digital in terms of apparent realism and non-manipulated objectivity, connected to the intuition of an apparently fundamental ontological shift between 'old' film-based photography and 'new' digital photographic practices. This discourse seems to overlook how one can give us insights about the other.[4] (iii) as digital technology applied in photography advanced, I noticed the ways in which it was increasingly displacing the agency of the photographer to the apparatus through its pre-programmed settings, scene modes, shutter priority and automatic focussing functions. These mechanisms supposedly improved usability and reduced the need for distracting adjustments to be made by the photographer who could now focus full attention to the photographic event. The particular affordances, limitations and ways in which I could manipulate film were familiar to me but digital cameras with their pre-set programs often seemed more likely to inhibit the agency of the photographer and limit the way artists often modify camera apparatus away from their intended use. Early digital cameras offered categories of images; landscapes, portraits, sporting scenes, night scenes with no option to override *f* stop and shutter speed. Ultimately, this standardised technical apparatus began to program its operators to see in a certain way. When degrees of autonomy and decision making are taken away in the act of photographing and instead assigned to a program whose mechanics you cannot see, nor manipulate its functions, the photographer is then perhaps more akin to an operator. Whilst it is now well recognised that digital photographic practices have collapsed time and space and accelerated the photographic process, at the same time new emerging digital technologies began to distance the photographer from the physical, material and still poorly

[4] It is important to underline that when this thesis uses these terms, the concept of the 'new' is very much related to the uses of photography which have changed dramatically with the advent of the internet.

understood functions of the apparatus. It seemed to me that in digital photography, image making was becoming more and more deferred amongst a complicated collaborative network of other agents. Despite this, in the following, I will argue that the triadic structure of relations between photographer, camera and world that constitute the photographic process remains useful for thinking about both film and digital photography as a continuum. In doing so, the shifting agencies of the collaboration between the elements of this triad and how they are influenced by the material affordances of the apparatus becomes visible.

Undertaking my PhD as a fellow of a Marie Składowska Curie funded Initial Training Network: *CogNovo: Creativity and Cognitive Innovation* at Plymouth University informed my understanding of models of cognition from contemporary cognitive sciences. My research became concerned with exploring relational models of cognition 'in the wild' (Hutchins, 1996) that could support my thinking about photography as a creative practice that extended beyond the lab. During the write-up stage, I became lead researcher for TAaCT, a collaborative research project within a digital medical simulation centre at Torbay and South Devon Hospital [5]. During this collaboration between Digital Horizons at Torbay and South Devon NHS Foundation Trust and Transtechnology Research, the further implications of this thesis became apparent in seeing the need for a more thorough account of how technologies of representation are understood, particularly in contemporary medical training where they are used to engage directly with human feeling in a high-risk profession. Medical simulation is an apprenticeship model of educational activity that utilises a curious mix of media, technologies and approaches from arts, gaming, theatre, film and the aviation industry to replicate clinical scenarios. Typically, a medical simulation centres around an animatronic manikin that imitates physiological responses such as a

[5] The publication entitled *TAaCT: Technology, Affect and Clinical Training* which outlines my research outcomes from the collaboration between Digital Horizons at Torbay and South Devon NHS Foundation Trust and Transtechnology Research can be found in the appendices.

palpable pulse rate, pupil dilation, breathing sounds, and monitor readouts, acting as a proxy for human patient. The manikin's responses are controlled remotely by medical consultants and simulation experts from behind a one-way observation window into a mock emergency room. The complex mix of technologies fortifies clinicians with the ability to recognize, absorb, interpret, and be moved by stories of illness and thus make critical decisions for diagnosis and treatment of the 'patient'. In the construction of realistic scenarios medical simulation narratives are technologically dependent on high realism and high fidelity. In the pursuit of realism and high-fidelity scenarios, narratives are constructed using Transmedia storytelling (also known as transmedia narrative or multiplatform storytelling) - the technique of telling a single story or story experience across multiple platforms and formats using a relational meshwork of technologies including: animatronics, digital X-Rays, alarms, monitor readouts, sensors and surveillance cameras. A team of clinicians and actors collaborate to decode cues from the representation of signs and symptoms offered by an interconnected cluster of media that shape responses towards the diagnosis and treatment of the patent. It became evident to me there are multiple avenues for the misinterpretation of images of which the distancing of the operator/photographer is one of many equally consequential, invisible and understated complications in the use technical apparatus. I realised that that as photography has become more complex, its relationship to truth, and its implications for responsibility and accountability in these wider contexts has only become more problematic.

This consequence also appears to be a concern for an independent research agency I had been following closely, called Forensic Architecture, based at Goldsmiths, University of London. This multidisciplinary group, who had been nominated for the 2018 Turner Prize, undertake advanced spatial and media investigations into cases of human rights violations, with and on behalf of communities affected by political violence: human rights organisations, international prosecutors, environmental justice groups, and media

organisations. Forensic Architecture founder and director Eyal Weizman (2017) states its primary mission is research, to "develop evidentiary systems in relation to specific cases"; in so doing, it acts as "an architectural detective agency", working with NGOs and human rights lawyers to uncover facts that confound the stories told by police, military, states and corporations. What interested me about this group was their pioneering methods for reading visual artefacts. As an interdisciplinary team of artists, journalists, 3D modellers, architects, animators, coders, lawyers using video, surveillance data, social media and other open source information they uncover overlooked information to determine crimes that have been made against civilians. In documentary and citizen driven journalism practices, that utilise drone, satellite and surveillance imagery together with social media sources, we are beginning to understand the changing landscape of photography that decentralises the human being, the witness or the 'unitary self' from the framework. It is clear that technological photographic practices attenuate the decision-making process, now less connected to seeing and responding but more to pre-empting and post hoc recovery, viewing, construction and analysis. It seemed to me there was little literature addressing the changing ontology of photography in a way which sees this practice as a continuity and where human vision is no longer always central to this practice. Furthermore, whereas recent debates in the field of photography were concerned with the political reaction to single images, we now encounter 'image complexes' – a time-space relation between dozens, sometimes hundreds of images generated by different means from the multiple perspectives of ground, air and outer-space. Weizman (2016, np) describes how "incidents are mostly interpreted as a giant 'spot the difference' game undertaken between two or more images before and after the event". Understanding how photographs are produced has immense implications for the way they are read, especially for truth seeking practices such as law, science and medical professions. Weizman claims it is the sensibility of artists, architects and filmmakers that is very important;

> When the most important piece of evidence coming from the battlefields worldwide is videographic, you need videomakers to make sense of it. They would be the right people to look at it to notice the nuances of colour and shade and blur and to understand how one piece of video might relate to another. And indeed, the aesthetic sensibility of an artists, architects and filmmakers are very useful in figuring out what has taken place (Evidently Art, 2019).

This level of engagement with photographic materiality reinforces my position that photographs are the manifestation of many processes not just a depictive image. An understanding of the materiality of the image is ever more important now for the image viewer. Recently, a new wave of artists interested in investigative aesthetics have shaped a new art movement called Evidential Realism which acknowledges the realism of today is complex and often veiled. A surge of art exhibitions such as Evidentiary Realism at the NOME Gallery, Berlin (01.12.2017 –17.02.2018) and Burden of Proof: The Construction of Visual Evidence at the Photographers' Gallery, London (02.10.2015 - 10.01.2016) and Towards an Investigative Aesthetics at Museu d'Art Contemporani de Barcelona (MACBA) (28.04.15 15.10.2017) featuring artists, such as Harun Farocki, Ingrid Burrington, Jenny Holzer, Hans Haacke, Eyal Weizman, Thomas Keenan, Mark Lombardi, and James Bridle, engaged in investigative, forensic, and documentary art. Their aim is to articulate a particular form of realism through art that portrays and reveals evidence from complex social systems, by prioritising formal aspects of visual language and mediums. Artworks critically explore the notion of evidence and its modes of representation. Paolo Cirio (2017) an Italian artist, activist and curator points out "Whilst realism of the past has been the depiction of social reality – of war, poverty, social pressure, today if you want to depict war or global inequality you need another form of visual language. In particular you need to investigate and research to find what's underneath the formation of society". Evidential realism is the visualisation, the transformation of that investigation and material that was hidden or too complex, bringing it into the gallery so that the public can be moved and understand. The investigations of these artists aim to challenge public apathy, and raise

empathy, to encourage awareness of out of date legal systems, and reveal the social manipulations of big tech. By producing more sophisticated ways in which to deal with complex visual evidence, the movement is also concerned with providing another layer of evidence for the courts. The observation that contemporary life is characterised by exposure to a seemingly endless daily stream of images lends an urgency to the need to understand the way images come into being. An essential aspect of this can be achieved by prioritising a sensitivity to the material and formal aspects of visual language and mediums. The work of Forensic Architecture and Evidential Realism artists indicate where others see this as important too.

Early in my research I identified the contact sheet (or proof sheet) from 35mm and medium format photography as an important artefact for this study. In this work the contact sheet is seen as evidence of a usually unacknowledged exchange between the photographer, the camera and the world. My research in the medical simulation suite only reinforced my sense of the significance of investigating the contact sheet because this processual artefact exposes what have become understated, invisible consequences of the exponential shift /expansion of photographic media and its deployment in contemporary times in a range of critical contexts (ie. medical, legal, forensic, military). I realised that thinking through historical material and exposing some of the hidden processes behind how images are made could assist in offering a continuity between film and new technological photographic practices.[6]

[6] To clarify, the intention is not to trace the origins of particular media and practices -where things began or where they finished. The interest is in 'affiliations' (the attachments and connections between media and practices) and 'resonances' (the sympathetic vibrations between things) and the 'through' and 'against' of things. Instead of tracing linear sequences and chains of events the thesis will think in terms of webs, clusters, boundaries, territories, and overlapping spheres in understanding where the continuity lies across photographic processes.

In my search for contact sheets it became clear that these artefacts had been suppressed as an object throughout the history of photography, to the extent that it suggested to me that the physicality of photography needed to be hidden to preserve its enigmatic image. It became apparent that the contact sheet had been undervalued, and so often suppressed in favour of 'selected' images, however this is essentially an historic tendency. In the 1990's the contact sheet started to become redundant, to the extent that in the present day they are for the most part curiosities, as so much of photographic practice uses digital software programs to manage images.

In offering an alternative history and alternative understanding of the medium, it was important that none of the photographers in this thesis are unknown. This is not an account that seeks to recover neglected figures from the margins but one that seeks to open up a suppressed but crucial element running through all photographic practice, including those that form the canon. The difficulty in accessing photographic archives and agencies like Magnum is perhaps partly a symptom of photography's reticence about its working processes and the vexed question of authorship. Contact sheets carry a kind of ambiguous anxiety, they offer covetable evidence of the photographer's more intimate narrative – and in fact offer the potential to reveal untold secrets, which may impact on the narratives associated with canon. It may be for this reason that access to them is restricted, for example, the Henri Cartier-Bresson Foundation archive in Paris ultimately did not allow me access to the contact sheets.[7]

[7] Since the Foundation Henri Cartier-Bresson website claims it "enables researchers to carry out their studies with more ease" and welcomes "a debate on photography by organising conversations and interviews", I approached them about accessing contacts sheets. I had several lengthy emails discussions with the curator (in French) in which I was asked to describe my purpose in detail. Having agreed to meet me and provide access I travelled to Paris with their requested 'letter of support' only to be refused access to the archive with no clear reason. It seemed to me this institution wanted to protect the genius legacy of the photographer and preserve the mythologies it had helped to create through art history.

To make the discussion manageable this thesis has chosen as its arc the genre of photojournalism and documentary photography, from 1930's post war Paris to present day. It also offers some examples from fine art photography where the artwork's ontological or world-making (rather than just representational) capabilities demonstrate photography as a means of philosophical engagement. Its story begins with the advent of 35mm Leica camera because its technological innovations speeded up the way photographers could see and respond in the moment. It uses this to make a continuity between film photography and digital technological practices of photography, also described as computational photography.[8] While it draws influence from theoretical work that seeks to address the challenges of making sense of the contemporary digital image complex, it does not claim any ground into the specifics of coding, algorithms, machine seeing, and networked camera technology.

Part one

The thesis begins by setting out the problems by reviewing some of the existing photographic literature and then introduces a new framework through which to recalibrate the existing human-centred discourse. It chooses as its starting point for this discussion Cartier Bresson's influential concept of the 'Decisive Moment' and the extended discussions that it has accrued (in art history, photographic theory and media theory) to position it as one of the most influential theoretical approaches to understanding modern photo documentary and photojournalism. It concludes by opening up this body of discussion to ideas of meshworks that have been developed in material culture and new materialist debates in order to resituate the photograph as the manifestation of multiple

[8] The broadest definition of computational photography includes just about any digital imaging at all. Unlike film, even the most basic digital camera requires computation to turn the light hitting the sensor into a usable image. The first real computational photography features were arguably object identification and tracking for the purposes of autofocus. Face and eye tracking made it easier to capture people in complex lighting or poses and object tracking made sports and action photography easier as the system adjusted its AF point to a target moving across the frame.

meshworks, including human cognition, in action. This section also provides a rationale and method for reading contact sheets as a way to approach the task of describing the meshwork of components and dynamics that bring photographs into existence. One of the challenges of writing about photographic practice as a relational ontology is the extent to which the 'meshworks' (Ingold, 2011) that can be seen to constitute and produce the image are theoretically limitless. For this reason, in many sections of this thesis, technology offers a focus with which to frame the discussion. Technology, however, is not some isolated machine that can be perfectly controlled, it is deeply interconnected with other technologies, with industries, organisations, markets, economies, and with its surrounding natural environment. As technologies have become more complex and interconnected, they have also become less linear and predictable. For these reasons it is necessary to rethink technology as just one interrelated component within a relational ecology. The relational ecology described in this thesis is the examination of technology's interactions with other technologies, with organisms (including the photographer) and with the environment. This ecology is an open system that behaves in a way that is self-organising and characterised to some extent by uncertainty and dynamism.

The recent shift in ecological thinking across humanities, science and technology (Barad, 2007; Bennett, 2009; Stengers, 2013, Manning and Massumi, 2014) breaks down distinctions that have persisted between the natural world and humans, and between environmental and industrial and technological systems and remains a powerful lens for understanding complex, ever-changing systems. Incorporating these ecological models into transdisciplinary modes of practice opens new apertures for the understanding of agencies that are non-human (technology and environment) and the exploration of new systems, synergies and wholly collaborative work.

Chapter One: Towards a Non-anthropocentric Approach to Photography, challenges the centrality of the 'all-intentional' human as the sole author of the photograph. It's primary focus is a literature review of recent decentralising discourses in theory. A number of strands of critical theory emerging recently in the arts and humanities offer support in questioning assumptions about photography, most particularly that it is essentially a human-centered practice (Zylinska, 2016; Bolt and Barrett 2012). In this respect, the discussion considers a recent shift towards accounting for technology as agential (Ihde, 1979; Barad, 2007) and that wider reality is constituted by an extended meshwork of materiality's and temporalities (DeLanda, 1997; Ingold, 2007). The chapter discusses what this new materialist approach, which recognises matter and technology as agential and acknowledges the contingency of a meshwork of interrelated agents that span humans, non-humans and technology, can offer a re-reading of photographic practice. Such methods are appropriate in addressing a recent change in the ontological status of photographic practice brought about by new materialist thought. For photography in particular, a new materialist approach reconsiders the impression that the photographer creates a representation of the world that is separate and stands apart from the photographer. This chapter will address what emerges through new materialist discourse in relation to the triadic that spans humans, non-humans and technology.

Chapter Two: The Deceit of the Decisive Moment, reveals how Cartier-Bresson's purist approach made him a pioneer for the new formalism in photography. Using prime lenses and allegedly never cropping or editing, Cartier-Bresson's approach turned over agency to the apparatus. In finding aesthetic qualities inherent in the photographic process he shifted attention to the camera. Cartier-Bresson's formalist approach reduces the authority of photographer yet there is a moment of profound contradiction when the title of his book was changed by his editor to *The Decisive Moment.* The book's emphasis on personal vision deflected attention away from the role of the random, accidental and uncertain that were

stressed elsewhere in his photographic approach. Revising Cartier-Bresson's 'Decisive Moment', in light of recent writing, this chapter reconsiders Cartier-Bresson as 'a master of chance' and reframes 'the decisive moment' as an attenuated process, distributed across corporeal and material dimensions of reality. In highlighting the relational meshwork of persuasive determinates that come to bear upon the 'decisive moment' it lays the ground for the questions posed in chapter six which ask, how and where in technological photographic practices is decision making deferred?

Chapter Three: Reading a Relational Meshwork in the Contact Sheet, offers a rationale and a methodology for using contact sheets as a mode of understanding relational meshworks. It devises a series of diffractive techniques aimed at disrupting and dispersing a photograph's representational apparatus so that an alternative to representationalism may be revealed. For decades before the advent of digital technology, the proof sheet or contact sheet was vital to the practice of professional photography. Photographers using roll film were able to see positive images in the small-scale grid of the contact sheet, which was marked for printing and then served as a tool for reference, cataloguing and archiving. These artefacts are valuable to this study since they offer a privileged window into the entire working process of the photographer from their strategies in the field to the darkroom, selection, printing and editorial process. Yet the largely unexplored territory of the contact sheet is also useful as a mode of understanding relational meshworks of creativity and collaboration – the perceptual, technological, material, environmental and causal persuasive factors that bear upon the 'decisive moment'. Instead of reading the contact sheet as a series of discrete images or as a chronology this thesis will look at the artefact in its totality. It aims to make the distinction between an image that is simply a picture of the world and a materialist image that invites us to go beyond the image to see the abstract framework and apparatus that holds it all together. This method is used as a

strategy in the critique of representation and to question what the singular image can or cannot say.

Part two

The second part of this thesis uses three very different contact sheets as case studies of close analysis. From many thousands of possible contact sheets these were chosen in part because they are exemplary of the approach to photographic practice in their field. The first contact sheet is an example of the Magnum 'humanist' style from contemporary photojournalist Jonas Bendiksen which shows the hybrid style where documentary photography crosses over with art. The second contact sheet discusses the work of a self-employed press photographer Kees Molkenboer whose formulaic photojournalistic work regularly appeared in newspapers in the Netherlands. The third contact sheet by John Hilliard belongs to a seminal conceptual work in fine art photography. This final contact sheet has been chosen for three reasons: it exemplifies an almost automated approach to photography; it reveals how frequently the intention of the photographer is contradicted by the animism of other determinates; finally, it demonstrates how the hidden participants in photographic practice are edited out, foregrounding the authority of the artist.

Chapter Four: A Non-linear Model of Causality in the Emergence of Photographs, makes a diffractive reading of Jonas Bendiksen's contact sheet from his *Satellites* (2000) series to focus attention to the processual aspects of photography. Photography is often said to be an essentially causal medium which has strengthened the idea that photographs are objective representations of reality. Although it would seem as if there are direct relationships between cause and effect, photography is an entirely processual medium made up of many interconnected cognitive, social, cultural, technological, material, chemical and environmental processes. Through a close reading of Bendiksen's contact sheet this chapter will bring to attention the dynamics of the photographer's negotiation

with some of these processes to give a thicker account of photography as a situated and collaborative activity.

Chapter Five: Photography and the Networked Nature of Cognition, makes tangible some of the cognitive negotiation and distribution of decision-making behind the documentary sports image. It begins by giving a detailed account from the perspective of a helicopter cinematographer filming the live television broadcast of the 2019 Cardiff Half Marathon and the technological framework that enabled this. Extending the cognitive anthropology written by Hutchins, and the anthropology of technology by Lucy Suchman (2017), this chapter briefly examines the distributed division of cognitive labour between individuals and technologies as they form increasingly complex systems and networks. The chapter then offers an historical example of medium format film photography by press photographer Kees Molkenboer, who photographed football matches for Dutch newspapers in the 1950's. Although this technological system is less complex, it shows a very concentrated level of human cognitive interaction when working with the tightest restrictions. A close reading of Molkenboer's contact prints establishes a distributed model of perception and decision-making by revealing the ways in which cognition changes when it incorporates devices or technical processes, and whilst negotiating the fast-changing dynamics of their environment.

Chapter Six: Photographer Collaborates with Camera Apparatus, discusses some of the black-boxed complexity of interactions that make the photographic event possible and some implications for images created by an apparatus which increasingly diminish human input through automated functions. It begins by discussing the work of conceptual photographer John Hilliard who sets out to question if the camera has its own condition. More than just a description of the mechanical components of the camera, this chapter extends the discussion using Vilem Flusser (2000) and Harun Farocki, who raise concerns

about losing photographic freedom to pre-set modes and standardised operations of the camera apparatus, together with Barad (2007) and Ihde (1979) who consider technology as agential and not neutral. These perspectives call for a more complex understanding of technological agency the role of the camera apparatus used in decision-making processes. The chapter concludes by returning to Hilliard's work through his contact sheet which manages to answer his own question but not in the way he intended the work to be understood.

Chapter One: Towards a Non-Anthropocentric Approach to Photography

Theories of photography mostly offer up a set of overarching, generalised qualities and functions about how photography operates and why. What is a photograph? What is photography? What is the medium? - these questions would appear to be a necessary basis for its theorisation except they seem to merely describe the photograph as a "transparent envelope", as Roland Barthes (1981 p.5) called it – a thing that we *see through* in order to get information about the world. Attempts at finding coherent theories that question what a photograph is, relative to all its forms, tend to unravel as different contexts of use and value pull in different directions. Even though photography has become embedded in our everyday lives on so many different levels, the traditional scholarly and curatorial way of discussing this medium still maintains a relatively narrow set of humanist and human-centric frameworks and discourses on the topic: photography as art or photography as social practice. The first framework is rooted in the methodology of art history and is encapsulated by numerous histories of photography, "typically narrated as stories of the evolution of the medium featuring those rare singular actors identified as artists" (Zylinska, 2017 p.3). In the art historical view, photographs are positioned as discrete objects that are framed and displayed individually or as a series in galleries or other cultural institutions. They are then analysed in aesthetic, semiotic and economic terms, for example in terms of how they affect us, what they mean and what their value is. The second framework of interpretation tends to analyse photographs in terms of their sociological relations. Photographs are contextualised in terms of how people take and make photographs but also what they do with them: how they place them in family albums, museums or archives, how professionals differ from amateurs and how they all contribute to the emergence of "popular taste" about photography (Edwards, 2012 p.221). The area of photography as professional practice – mainly in the documentary and photojournalistic tradition, but also fashion, editorial and advertising – tends to fall in between these two traditional

frameworks with the market acting as an adjudicator of appropriate categorisation (Kember and Zylinska, 2012).

Instead, this thesis considers photography as a different kind of process from one limited by its reference to the photographic object. It aims to arrive at a different understanding of photography that acknowledges the practice as a series of relational and contingent processes that co-produce a photographic event which manifest in photographic artefacts. To begin to understand how photographs come into being through a relational meshwork of determinates, this chapter surveys theoretical approaches beyond photographic theory that can help to move the conversation beyond issues of intentionality, authorship, and legacy of the photographer. The question this thesis specifically asks, is how do photographs come into being as a relational meshwork and what does this mean for the way we understand photographic images? This question aims to understand who or what else, besides the photographer, is constraining or making possible the emergence of a particular photographic event or artefact. This chapter aims to address gaps in the photographic literature by providing a fuller account that has broader repercussions for the way we understand processes of creativity and the emergence of media artifacts – seeing them as entangled and enmeshed across various corporeal and material platforms and scales.[9]

Almost from the outset there has been a debate about photography's faithful relationship with the world that has endured through the history of photography, and this debate is intensified with the proliferation of platforms and possibilities made available through digitalisation. While analogue photography was always subject to editing and defined by the same pictorial conventions as painting, it is now possible to make convincing images of

[9] Corporeality meaning the multi-sensory, kinaesthetic, bodily-based activity, feeling and experience, and materiality meaning the affective and responsive domains of matter, materials and objects (an environment) amidst which the body is immersed.

people and things that never existed. Although this complicates the discussion, it now forces the necessity to rethink photographic practices in broader terms. There is recent body of literature from fields such as posthumanism, philosophy of technology, science and technology studies, material culture, anthropology, and new materialism that invites other kinds of theoretical approaches to help understand the photographic image and its relationship to the world by rethinking the balance of agency in the photographic process. This thesis offers some relief from the binary debates of sign and signified by introducing the triad of apparatus, photographer and world in a collaborative interaction that counters the overemphasis on the centrality of the human agent in photographic theory at the expense of considering the material aspects of photographic practice. This approach, whether regarding individual photographers or genres, relies heavily on an assumed quality in human creativity that is rational and accountable, whereas the claim of this thesis is that to a significant extent the agency of decision making in photographic practice might be better understood as distributed between a network of human and non-human 'actors'. Although these 'actors' include the cognitive faculties of the human, creativity and decision making is understood as situated actions within a dynamic world of non-human agencies that all participate in varying degrees in the act of *making*, and not *taking*, a photograph.

1.1 The dominance of the anthropocentric approach

The following considers how the discussion of photography is largely auteurist, with a tendency to focus on human-centred approaches borrowed from art history (Galassi, 1981; Newhall, 1989; Szarkowski, 1989; Warner, 2010). Ariella Azoulay (2015) claims that the discourse of the photograph is characterized by an "over-identification with the property of the photographer" (p.23). According to Azoulay, reference to the photographic image still remains a precondition for any discussion in photography. She identifies two principles that lead to this tendency: the first, that the photograph can be considered as a form of testimony; the second, that the photographer-owner is able to determine when, and if, the

event of photography unfolds (pp.23-24). Azoulay demands instead an ontological account of photography that should instead "suspend patterns of photographic use as they have been institutionalised" (ibid). Azoulay argues that the institutionalised discourses of photographic theory and the way in which their combined accounts tend toward a centering of the photographer as the source of the image contribute to the impossibility of discussing photography as an event or, as it might better be understood, an "unfolding". For Azoulay, being able to address photography in this other way is necessary because within a technological context where images be produced without cameras and lenses, or may remain as data, processed, but unseen by human eyes. An account of photography based on events instead of images responds then to the fact that "the event can emerge in the absence of either camera or photograph and can address, for example, the implications of an image that does not yet exist" (ibid).

This auteurist view will be challenged in chapter two, where it is more fully discussed in the context of Cartier-Bresson's 'Decisive Moment'. It will ask - who or what else, besides the photographer, is constraining or making possible the emergence of a particular photographic event or artefact? In order to challenge the dominant anthropocentric position, this chapter first unpacks the dominant theoretical frameworks through which photography has been understood. These are based around four central concepts: the index, the punctum, signification, and the specificity of the medium. The photographic theory of the last forty years has centred around these essentially constructivist or reductionist concepts and as a consequence has prevented discussion of photography's arbitrary nature or its proneness to chance by overlooking that photographic practice is contingent and embodied.

Anthropocentrism, as originally described in environmental ethics, is the belief that value is human-centred and that all other beings are means to human ends (Kopnina *et al.*, 2018).

Whilst it is accepted that photography is solely a human pursuit, this thesis questions the anthropocentric narrative that has underpinned our view of humans in the world since enlightenment, "a view that posits humans as makers of the world and the world as a source for human endeavours" (Barret and Bolt, 2012, p.3). This anthropocentric worldview has meant that the material or environmental counterpoints to human agency have generally been given short shrift in scholarly discussion (Knappett and Malafouris, 2008). Thinking about these theories in relation to creative activity, and in particular photographic practice, offers an alternative narrative to the received history by which the study of media forms had typically been understood. In recognising and refiguring the 'organism'[10] the photographer works within; this chapter considers how non-anthropocentric approaches might inform a relational ecology of film and photographic practices.

Part of the problem of the lack of conceptualisation of photography and the way in which photography has been understood, is because its origins have been studied in their connection to scientific technology. The reason being is that unlike painting, sculpture, drawing and printmaking, photography was considered a form of mechanically reproducible image making (Daston and Galison (2007), generated by a machine and therefore incapable of being a medium for unique artistic expression. Kelsey (2015) states, "The technology's indifference, its insistence on giving a bucket the same attention as a bishop […] raised conflict whether such an automatic mechanism could accommodate imagination" (p.2). The 'mechanical retina', a term associated with the camera in the

[10] Whitehead's (1929) philosophy of organism is a form of process philosophy. This type of philosophy seeks to overcome the problems in the traditional metaphysical options of dualism, materialism, and idealism. From the perspective of process philosophy, the error of dualism is to take mind and matter to be fundamentally distinct; the error of materialism is to fall for this first error then omit mind as fundamental; the error of idealism is also to fall for the first error then to omit matter as fundamental. The philosophy of organism seeks to resolve these issues by fusing the concepts of mind and matter, thereby creating an 'organic realism' as Whitehead also named his philosophy (Sjöstedt-H, 2016).

nineteenth century, rendered visible what was invisible to the eye and as a result photography became entangled with the systems for measuring, classifying and the ordering of the world through images. The medium's capacity to offer photographic 'evidence' placed it in the centre of the techniques of representation and regulation that are central to the network of modern and disciplinary institutions as the police, the prison, the press, the asylum, the family, the hospital, the school or the courtroom. This mitigated against the acceptance of photography as a legitimate medium for making artworks until the 1920's when it started to be incorporated into artistic practices by surrealists, Man Ray, Alfred Stieglitz, László Moholy-Nagy, Brassai, Imogen Cunningham and later Henri Cartier-Bresson, Otto Umbehr for example. Although various artists had been using photography as a conceptual medium since the 1920's, and the Museum of Modern Art in New York was influential in developing a transformative period of modern photography as fine art, it was only much later in the 1970's that photography became recognised as fine art in the UK.

In the 1960's new literature began to emerge as part of art historical discourse that challenged the conventional notion that the invention of photography was fundamentally a technical achievement, without artistic roots. As the photographic image is a picture, this literature allied the photograph to sociological literature and other discourses and categories within which the image was the sole subject of inquiry (such as Barthes, 1961,1964; Moles, 1971). Photography-was-invented-by-painting theories emerged, that were advanced by influential photography curators such as Peter Galassi from The Museum of Modern Art, in his book *Before Photography: painting and the invention of photography* (1981). Since then, art historical discourses have become accustomed to analysing the photographic image in terms of paintings and other classical visual culture using theoretical concepts such as representation, meaning, spectacle, semiosis, mimesis. However, photography belongs to a broader domain in modern culture and is primarily used for non-aesthetic purposes such as

ID pictures, newspaper photographs, mail order catalogues, tourism, scientific imaging, forensic and crime scene photos. The problem of indexicality is in many ways related to this use, inasmuch as the evidentiary status given to photography interpreted in this way are all predicated on the presumption of indexicality.

In traditional accounts, photography's technological mode of making gives the illusion of a seamless continuity between the world and its representation. The problematic relationship of photography to indexicality has reinforced this. In photographic theory there are two camps of theorists; realists (Barthes, Bazin, Sontag, Krauss) who hold a positivist theory of causality of the image (the index as a sign caused by its referent), and the anti-realists who believe there is a transformation between the referent and the photographic image (Eco, Burgin, Wollen, Berger, Tagg). The postmodernist position - that truth is not located in the photographic image - has a direct bearing on photography's instrumentalities, its material effects and profound entanglement with the social, ideological and political which hinges on the claims of photographic truth.

With the spread of digital cameras since the 1990s, the validity of the photo-index theory is now generally mistrusted by media theorists. Rudolf Arnheim pointed out in his seminal article *On the Nature of Photography* (1974), how photography escapes from being "a mere mechanical copy of nature" in part because of the presence of the photographer. Certain ethical and stylistic consequences follow from the close connection between photography and "physical reality" or "the facts of the moment." The picture taker is on slippery ethical ground since "the photographer is part of the situation he depicts" and his picture, like the photon in atomic physics "upsets the facts on which it reports" (pp.151-152). Tom Gunning (2004) points to the physicality of the camera as a mediator between the photograph and reality. He notes that "the mediation of lens, film stock, exposure rate, type of shutter, processes of developing and of printing become magically whisked away if

one considers the photograph as a direct imprint of reality (p.40). However, those disciplines who still use photographs as a staunch evidential basis to underwrite all the juridical, scientific and veristic uses of the medium seem still unconcerned by the profound ethical and moral consequences of photo truth claims. Implicit in the belief that the photograph never distinguishes from its referent (what it represents), is a problematic theory of causality. The image may have been created indexically - light on emulsion, yet it the image has no necessary relation whatsoever to the meaning attributed to the picture. The theory of causality of the image used by these disciplines elides to allow them to recognise the nuanced notion of photographic truth. As art historian Abigail Solomon-Godeau writes "The refutation of photography's truth claims, as well as the critique of the photographic record, have been motivated by the recognition of the ways in which photography has been instrumental, both ideologically and politically, in the service of racism, imperialism, and sexism and in its conscription to the interests and agendas of dominant classes and other formations of power" (Solomon-Godeau, cited in Elkins, 2007 p.261). Responding to the repressive logic of this disciplinary model, feminist, queer, antiracist, and postcolonial scholars have subsequently demonstrated that photography also allows for slippages and resistances, forms of double mimesis, disidentification, and double consciousness that resist official, normative strategies of categorization and containment (Smith and Sliwinski, 2017, p.3). This ambiguity in the photographic image signals the importance of a more thorough methodology for understanding photographic process; one that factors in an awareness of the complexity of the negotiation that happens during any photographic event. A consideration of the negotiation between photographer, camera and world attunes us to all that is not consciously or intentionally controlled in the making, circulation, and viewing of photographs, the contingency involved in the production and consumption of images, in addition to the unexamined motivations and effects of this technology's pervasive spread into ever-widening spheres of human and nonhuman activity. This is the complexity that is absent in the current photographic discourses.

A revised notion of the index proposed by Michel Frizot (1998) rethinks the index as a pointer, which is in fact a metaphor for a finger pointing at something that we want to show. Frizot claims "But this pointing is only causality taken inversely: it is because indexicality is a causal relationship that what we see depicted in the photographic image refers back, for us, to something that we know once existed". Roland Barthes notion of the *punctum* overlaps with this indexical function of pointing back for the viewer and their individual investment in the image. If the *punctum* is the viewers desire to discern something beyond the image, something that seems to live on. This *punctum* affect is usually seen to have its cause located in the original event depicted in the photograph. Thus, it is the lost reality of the moment "photo-graphed," the indexed referent, that causes the *punctum* or uncanny feeling (Iversen cited in Elkins 2007 p.254). David Bate (cited in Elkins, 2007 p.255) remarks on the overuse of the notion of the *punctum* which has "enabled a wholesale return to romanticism theories of signification, mythified and made respectable through the name of Roland Barthes". Part of the problem is that Barthes's view of photographic practice is limited; his preference is for portraiture, there more clearly to find death lurking behind the face of the photographed subject. The problem with the *punctum* is that it overclaims the viewers investment in the photographic image and suggests the desire that a spectator invests in a photograph is involuntary. Both the *studium* and the *punctum*, are tied to the subjective reactions of individual viewers, and as a consequence are not agile tools for analytic reasoning; rather, they are the last links in a chain of reductive thinking (Grundberg, 1981). If the essence of the photograph is found in death, the interpretation leads only to a dead end.

This overuse of the *punctum,* which overclaims the viewers speculation about the photographic image, has encouraged a tendency towards widespread subjectivism in much contemporary art and in photographic criticism about the specificity of meaning in the photographic image. The anecdotal and descriptive narratives that are used to support

documentary photographs are perhaps a result of disentangling the specificity of the medium from the aesthetic value in the image, treating photographs as purely images and less as objects. They also set up a model of photography that is inseparable from and driven by intention, subjectivity, imagination, and the forms of manual skill etymologically incarnated in the term "masterpiece".

Discussions of chance in photography and the agency of other persuasive factors in the co-authorship of the photographic image have only fleetingly been discussed in photographic literature because of the dominance of theories such as the index, semiotics and signification. This has had the effect of masking any discussion of photographs as a manifestation of many persuasive agencies – of matter, as well as the uncooperativeness of the world working with and against the intentions of the photographer. There is a constant variability in that interpretation, based on a variety of factors that can't all be measured. The dominance of this anthropocentric approach masks ways in which we might go about rethinking the multiple agencies implicit in photographic practice.

1.2 Introducing non-anthropocentric perspectives

The contention of this thesis is that a closer and more nuanced approach to the various agencies at work in both digital and analogue photography can build a pathway to a more continuous history. This helps us reconsider three orthodox assumptions about photography discussed in the first section of this chapter, which can be summarised as:

1. the idea that photography is a fundamentally human-centred practice
2. that photographic technology has a singular determining agency that is most often subordinated to the image
3. that reality is populated by fixed objects with boundaries

These assumptions correlate with the three sections of the literature review that follow and aim to provide a shift from a politics of representation to a politics of non-representation. This thesis will show how considering broader relations, new temporalities and multiplicities present a challenge to historical models of representation. Challenging these assumptions will allow us to see the history of photography, from pinhole to digital, as a continuous process and not as a series of segmented technical practices. This is helpful in order to look more closely at the shift in balance of collaboration between the photographer, the machine and the world. This brings to the fore theorists who have considered processes of 'making' with technology (including image-making) and the world not as a discrete operation of the machine but as a more collaborative process. This involves introducing theories that are not typically applied to understanding the practice of photography and the relationship between photographs and the world. This will also shed light on what might have been concealed in the shadows created by concepts such as the index and the punctum. To lay the ground for the following discussions in this thesis, this chapter will introduce three key theoretical perspectives drawn from 21st century critical theory in the arts and humanities that have will be used to enrich our rethinking the orthodox assumptions about photography. It will draw on Actor Network Theory (ANT), Process philosophy, Material Culture and Posthumanism regarding them as essentially as overlapping discourses that constitute the broad concerns of New Materialism[11]

In the following review, the literature has been grouped under three headings which correspond to the three prevailing orthodoxies in the photographic literature discussed

[11] Gamble and Hanan (2016, p.265) offer a definition of this approach "New Materialisms insist that humans and human discourses are always ontologically enmeshed with more-than-human configurations and also often seek to better understand how other-than-human creatures, critters, things, actants, objects and powers behave as meaningful agencies in their own right. As such, new materialisms invite us to revisit longstanding and foundational questions about the nature and scope of language, meaning, subjectivity, and how these relate to questions of ontology, ethics, and political intervention".

above. Each section corresponds with a later chapter in the thesis which uses case studies; predominantly close readings of contact sheets, to both challenge the continued dominance of semiology and enrich an understanding of the collaborative nature of photographic practice. The following sections will deal with; i) Meshworks of collaboration, ii) Agential technology, and iii) Distributed nature of cognition and human action. Each has been identified as main strands of current critical theory where a non-anthropocentric perspective is brought to bear on the emergence of visual artefacts. They have been chosen for their focus on political, cultural, material or technological aspects of media. Together these perspectives address very current concerns over agencies (human and non-human), materialisms (old and new), assemblages, entanglements, interactions, animisms, vitalisms, ecologies and relational ontologies and as such are appropriate for thinking about new technological photographic practices. These absent features of photographic theory could perhaps be dealt with by a recent body of literature from New Materalism. New materialism is an interdisciplinary, theoretical, and politically committed field of inquiry, emerging roughly at the millennium as part of what may be termed the post-constructionist, ontological, or material turn. Spearheaded by thinkers such as Karen Barad, Rosi Braidotti, Elizabeth Grosz, Jane Bennett, Vicki Kirby, and Manuel DeLanda, new materialism has emerged mainly from the front lines of feminism, philosophy, science studies, and cultural theory, yet it cuts across and is cross-fertilised by both the human and natural sciences (Sencindiver, 2017). It is perhaps worth stating here that the material feminist perspective used in this thesis differs from an 'earlier' incarnation of material feminism which, in its alliance with Marxist historical materialism, is principally concerned with the gendered inequalities entailed in the reproduction of capitalist modes of social and economic organisation. As Lenz Taguchi (2013) makes clear, it is also to be differentiated from a 'renewed' materialist phenomenological account on two fronts: one, because renewed materialism continues to privilege human subjects' experience of matter in relation to what matter affords or enables humans to do; and two, because it explains material

relations by resurrecting a mode of subjectivity based on conscious acts of making meaning which continue to gesture to a transcendent dimension with its hidden structures of truth or meaning beyond the human. So, although offering a valuable corrective to social constructionism, a renewed materialist phenomenological account "still takes the human subject as a starting point, and thus produces a negative and dialectical ontology" (Lenz Taguchi, 2013, p. 711). In contrast, in the Baradian-inspired 'new' material feminism invoked here, matter is not 'given' to the human but rather acts on its own terms in an emergent, contingent and dynamic practice of materialization which includes human and nonhuman bodies and gives rise to unpredictable, if sometimes enduring, assemblages and conglomerations. 'New' material feminism undoes the binary separation of knowing and being; and it troubles concepts of will, intention and agency, recognizing them not as individual possessions, nor as manifestations of the negotiated pull of structure and agency as in social constructionism, but as force, flow, affect and intensity distributed across a multiplicity of different human-nonhuman modalities (Taylor, 2016). New materialist theories pivot on the primacy of matter as an underexplored question and therefore pursue a materialist mode of analysis which enable new ways of thinking about creativity and processes of materialisation. Furthermore, these theories collectively hold the view that the human mind is constitutively entwined with material culture - whether these pertain to corporeal life or material phenomena, including inorganic objects, technologies, and nonhuman organisms and processes. This is a crucial concern for the direction of this thesis, which aims to more fully balance the relation between human centred and machine centred explanations to account for photography as a collaborative process.

In addition, this review introduces discussions from process philosophy for a more complete understanding of the different play of energies and model of causality in support of a new kind of process ontology of photography. Photography is a discipline well acquainted with process at different micro and macro scales of non-human and human life.

However, photographic theory has yet to bring together and consider the interrelatedness of these processes in a more inclusive 'process ontology' that would allow for a better understanding of the various energies that co-produce photographic artefacts and clarify the process in which images do not merely represent events but are themselves continuous with and materialised as events. In doing so it will meet the deficit of photography as it is now practiced and understood. It will supplement the Anglophone (English and French) literature of photography from the 1950s which has always been bound to think within a process framework about chemical and physical processes, time, events, technological advancements, social histories and transformations etc. Yet in spite of its long association with various process-isms' photography seems still lacking in a unified philosophy of process.

(i) Meshworks of collaboration

The claim that photography is a collaborative act is at the core of this thesis. This collaborative dynamic is a reciprocal relationship between the photographer and other humans, non-humans, technologies and environment, which acknowledges the agency in the creative process as variously distributed and possessed in relational meshworks of persons and things. It then follows that photographic artefacts can be said to be 'co-produced', having no single author. However, a broad literature survey on the subject of collaboration[12] identified the limitations of this literature whose focus upon effective strategies, outcomes, and human to human interactions were not conducive to a model of collaboration that aims to bring together not only people and ideas but also materials and technologies in a less hierarchical way. In order to consider photography as a collaborative process we first need to shift the attention from a focus upon outcomes of human

[12] This research was undertaken in the first months of my PhD since there was an emphasis on collaborative work between arts and sciences within this interdisciplinary doctoral programme. My survey specifically looked at literature across a range of disciplines where tools and technology are used, from business management, human-computer collaboration, creative industries, medicine as well as collaboration engineering approaches and evaluations of art science collaborations.

interactions through collaboration to readdress the paradigm that humans are the *only* creative agents and thereby the sole authors of all artefacts. This human centred model of creativity has been adopted by art history in a way that tends to inflate the superiority and intentionality of the photographer. Yet, more recently there is certain literature emerging from the humanities that starts to provide some relief to the innate anthropocentricism in art historical narratives.

In his essay *The Question Concerning Technology* (1977, p.6) Heidegger begins to address anthropocentricism when he questions the proposition that matter (including technology) is the substrate for the artists actions. Heidegger is concerned with the formulation of a different relation between humans and technology and undoes the Aristotelian notion of causality. In the place of an accepted notion that things are a means-to-an-end, he proposes a relationship of co-responsibility and indebtedness. Heidegger cites the example of making a silver chalice to suggest that the matter of the silver, what the chalice will be used for, and the artist are co-responsible for bringing the silver chalice into existence. Transposing this idea onto photography, Heidegger's idea would suggest that the artist does not create the photograph, nor is the photograph formed matter. Instead, he proposes that the artist is co-responsible for and indebted to other co-collaborators for the emergence of the thing as a photograph. The 'redistribution of power' posited by Heidegger's conceptualisation of createdness has much in common with New Materialist positions on political agency (Coole and Frost, 2010; Bennett, 2010). His rethinking of 'createdness' and his re-interpretation of causality shifts our understanding to a notion of care and indebtedness between co-responsible elements which are all agential. These ideas help to set up a broader understanding of human– non-human collaboration and foreground the following theories which aim to describe relational ontological approaches.

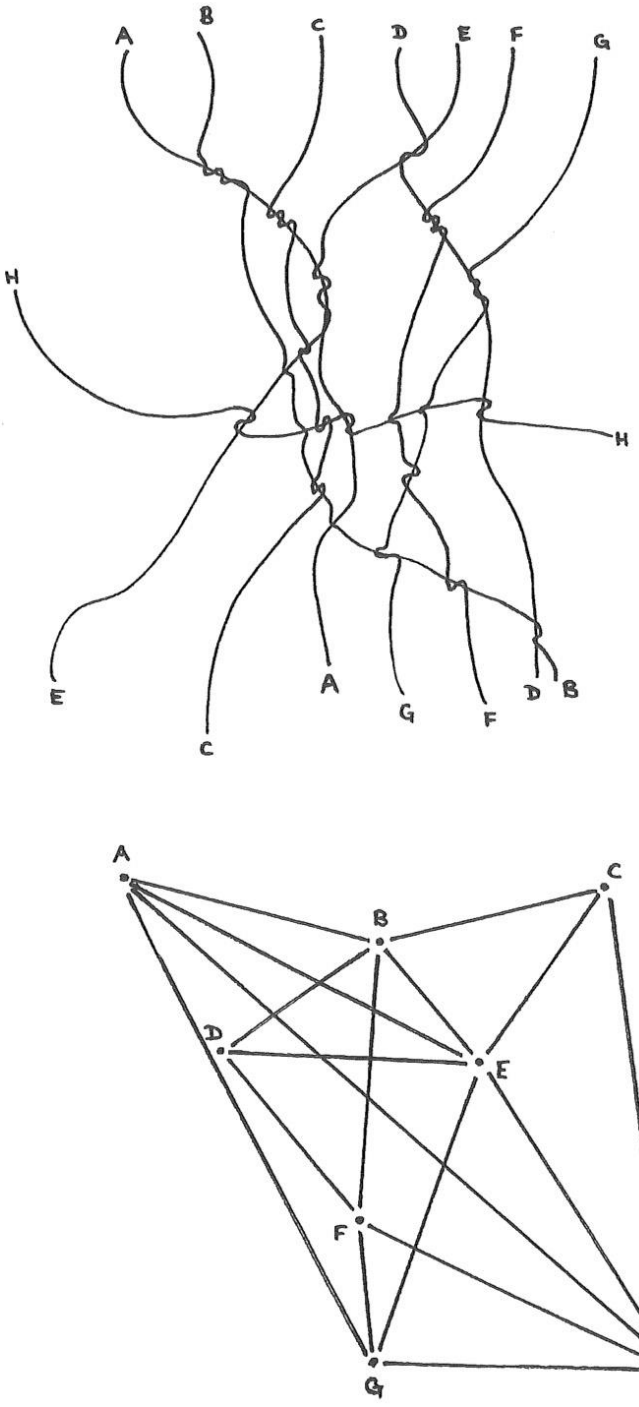
Insights from Actor-Network Theory (ANT), which originated from the sociology of science and technology, begin to offer some ways of thinking about the relations, processes and contexts that shape and mediate making. ANT has been used to understand the role of technology in the process that shapes the relational outcome of the interplay between technology and people. It also tells us that how we use technology shapes actions, forms and possibilities. The concept was initially developed by science and technology studies scholars Michel Callon (1986) Bruno Latour (1986) and sociologist John Law (1986c; 1986b; 1992), to stress the heterogeneity of the social world, the distribution of agential properties across the human/non-human divide, and the processes through which socio-technical collectives extend themselves (Shiga, 2007). The use of the word réseau (network) came from Diderot. He used it to describe matter and bodies in order to avoid the Cartesian divide between matter and spirit (Latour, 2017). ANT is best known for its controversial insistence on the capacity of non-humans to act or participate in systems or networks or both, thus, objects, ideas, technologies and processes, and any other relevant factors are seen as just as important in creating social situations as humans.

There are aspects of ANT discourse which invite ways of rethinking photography, for example the remoteness of powerful influences, how small events can have large consequences and equally how seemingly big influences can have small consequences. An advantage of thinking in terms of networks, Latour explains (1996 p.372) is that "we get rid of the tyranny of distance or proximity"; elements which are close when disconnected may be infinitely remote if their connections are analysed; conversely, elements which would appear as infinitely distant may be close when their connections are brought back into the picture." For instance, in the moment of trying to frame and compose a photographic event, a photojournalist on assignment might need to consider the printing preferences of the publisher located five thousand miles away and change the camera orientation and length of lens to account for the way it will be printed. Latour points out that the difficulty

we have in defining all associations in terms of networks is due to the influence of geography. "The notion of a network helps us to lift the tyranny of geographers in defining space and offers us a notion which is neither social nor "real" space, but simply associations" (ibid). The notion of a network as Latour describes it allows us to regain some of the complexity of a collaborative moment with which we might re-describe photography "its vertical space, its layering, its macro scale, its wholeness, its overarching character" (ibid). Although the network metaphor allows for a more inclusive and less hierarchical understanding of the variety of determinates that contribute to the emergence of things, the well-known critique of ANT is that it talks about the actors but not the connectors in the network and it doesn't address what is happening in the connecting distance between things. Also, the tendency in the literature has been to emphasise the stability of routines that guide the behaviour of actors, with the implication that organisational capabilities are also stable. Although Bruno Latour's notion of ANT refers to a notion of "distributed agency" that sees actors – human and nonhuman – as unfixed, and emerging from agential fields, that have a "networked intentionality" (Latour, 1993, p.261), the network in Latourian terms avoids the problem of patriarchal power as its own agential network in its situating of the relational. Although ANT alerts us to the idea of a network of determinates, it doesn't give attention to less easily described variables.

Anthropologist Tim Ingold picks up the idea of the network from ANT with an overlapping discussion that better accounts for a certain messiness that ANT does not recognise. This attention to relations and non-human agency is also recurrent in recent feminist new materialist positions (van der Tuin, 2014; Braidotti, 2012; Coole and Frost 2010; Barad, 2007; Bennett, 2001) in which scholars tend to take a more process-oriented view, rather than a clear and direct action-response based one, as proposed by ANT. Tim Ingold argues: "things are active not because they are imbued with agency but because of ways in which they are caught up in these currents of the lifeworld" (2007, p1). In Ingold's

meshwork model (see fig.1) we can understand how the social interaction with the hardware of technology is dynamic. The metaphor of a meshwork as Ingold (2011) describes it, is a relational field, not of interconnected points as in a network but of interwoven lines. Ingold's meshwork of entangled lines of life, growth and movement is distinct from a network in the ANT sense, which considers that the elements connected are distinguished from the lines of their connection. Ingold emphasises that entanglement and habitation along the trails of everyday life is messier than simple straight connecting lines and is more akin to a knotted interwoven meshwork of interaction, a life that is woven together by a web of movements. This is the world we inhabit. Taking the view that all things are enmeshed and entangled in a dynamic, emergent system of interaction, as Ingold (2008) suggests, this acknowledges that the photographer works with and against many other agential, affective forces and tensions such as the camera with its many program settings, the conventions of visual culture, a dynamic world of objects and other people and non-human entities which have their own temporalities and so on. Within Ingold's animistic ontology we see that skilled photographers and filmmakers do not propel themselves across a readymade world but rather move through a world-in-formation, along the lines of their relationships. This continual shifting of relations requires the photographer to continually modify their aims as they proceed, "stretched between the 'already' and the 'not yet' […] our waiting for the world and the world waiting for us (Ingold, 2015 p.138).



The meshwork of entangled lines (above) and the network of connected points (below).

Fig. 1 Ingold's distinction between a meshwork and network. Reproduced from Lines a Brief History (Ingold 2007, p.82) with permission of the licensor through PLSclear

Although Ingold makes a valuable intervention by acknowledging the messiness and fluidity in the relationships *between* actors, how do we now pinpoint the active agent or organise a mess? Until recently photographic theory and history have operated in a reductive way that has factored out any kind of mess, chance or contingency that threatens the intentionality and authorship of the artist, and which has been further repressed by indexical theories of causality of the photographic image. More complex models of reality, intentionality and causality are likely to have been supressed in photographic theory for fear of it weakening the bond between the maker and the photograph, calling into question what a photograph can be said to say, and undermining any discussions of photographic genius. Robin Kelsey (2015 p.2) remarks:

> For amateur and professional alike, the successful picture can be an uneasy source of pride. Pressing the shutter release button fosters a sense of having produced the photo, but how far does that responsibility extend? Has the amateur who has accidently taken a superb photograph made a work of art?

The conspicuous role of chance in photography sets it apart from arts such as literature or painting where chance comes across as something contrived and purposeful, whereas in photography it comes across as something encountered. How can the artworld deal with a medium that entails such a haphazard process of making, since chance lacks a constituency and repeatability? Kelsey remarks "generally speaking, it valorises neither the photograph nor the photographer" (ibid). The reintroduction of mess and chance into a new process ontology of photography would undoubtedly be very provocative to art history, yet it does help get to a deep relationality that hasn't fully been acknowledge in the discourse's implicit claims to artistic autonomy.

John Law (2004) argues that most current methods look for clarity and precision. It is usually said that only poor research produces messy findings, and the idea that things in the world might be fluid, elusive, or multiple is unthinkable. Law stresses it is time for a new

approach. Many realities, he says, are vague and ephemeral. "If methods want to know and help to shape the world, then they need to reinvent themselves and their politics to deal with mess" (Law, 2004 p.i). The problem for art history is that if the artistic production of artefacts is not substantiated by intention it becomes difficult to determine where responsibility is deferred amongst the 'mess work'. An acknowledgement of the mess and chance in the coproduction of photographic artefacts is not helpful in identifying who is accountable, who is responsible, who is the author or who has mastery of the medium. Flattening the process ontology becomes problematic for art history because in doing so it suggests there is no expert or genius to rejoice. Law's proposition points out the image is not innocent, most often images are made possible through techniques of deliberate imprecision.

Where an oversimplified thinking about photography has particular problematic resonance is in discussions of technological photographic practice where the human (the photographer) is not the central agent, and sometimes absent altogether from the photographed event. Although the human agent may be technologically interconnected, decision making may be deferred amongst a meshwork of determinates that include algorithms, technological apparatus, data compression codecs, Wi-Fi networks etc. These trends raise important questions concerning the ontological status of artefacts: How can we distinguish technical and material artefacts from human and social relations? How do we locate agency in a world where capacities to act are distributed across a wide array of materials? Who or what is the photographer and what now is a photograph? In order to recognise the role of artefacts in constituting the social world, do we need a notion of non-human agency? Depending on the field of practice these questions will have varying political, ethical and historical ramifications.

Based on these developments, questions regarding human-technical relations and agency have been an area of concern for media theory as the relationships between the human subject and the technical apparatus has become increasingly decentralised through automation. Whilst humanist thought placed the human subject firmly at the centre of the physical and social world, the emergence of new human-technological relationships has decentred the human subject. In his essay *Mindless Photography*, using space photography as an example, John Tagg (2008 p.25) is troubled by the severance of the relationship between photography and human sensation, between stimulus and response and goes as far to suggest new technological developments are:

> driving towards a systemic disembodiment that, accelerating in the technologies of cybernetics and informatics, has sought to prepare what has been hailed as the 'postbiological' or 'posthuman' body for its insertions into a new machinic enslavement.

Tagg's approach positions the apparatus in a somewhat dystopian opposition with the human. More recently however, there has been a confluence of currents across disciplines such as New Materialism and similar decentralising theories that have validated a re-thinking of the relationship between humans and non-humans in a more complex understanding of reality, against binary tendencies. At the core of the material turn is a concern with agential matter. As Iris van der Tuin notes, scholars from diverse interdisciplinary fields, continents and generations are developing theoretical tools for "dealing with agential matter rather than (gendered) passive matter" (van der Turin 2011, p271). These advancements in the age of CCTV, drones, medical body scans, and satellite images, where photography is increasingly decoupled from human agency and human vision, are seen to be pressing for new ways of understanding the active agent in the manifestation of photographic artefacts. According to Donna Haraway (1991) the "I" of new materialism is no longer the sovereign human subject but is conceived of as a material-

semiotic actor, an articulation that encompasses the human and the non-human, the social and physical and the material and the immaterial.

Barrett and Bolt (2013) investigate the notion of New Materialism through the practice of the arts and explore the material dimensions of artistic practice by asking how the agency of matter may impact upon human creativity which then raises questions about authorship. Joanna Zylinska (2017) takes this question forward specifically in relation to photography. Her book *Nonhuman Photography* begins to tackle a new philosophy of photography, going beyond the human-centric view to consider imaging practices from which the human is absent as agent. Zylinska argues further that even those images produced by humans, whether artists or amateurs, entail a non-human, mechanical element—that is, they involve the execution of technical and cultural algorithms that shape our image-making devices as well as our viewing practices. At the same time, she notes, photography is increasingly mobilised to document the precariousness of the human habitat and tasked with helping us imagine a better tomorrow. With its conjoined human-nonhuman agency and vision, Zylinska claims, photography functions as both a form of control and a life-shaping force.

(ii) Agential technology: image making emerges from distributed agencies

These technological advancements, together with a recent turn to consider technology as not passive but agential (Ihde, 1979; Barad, 2007), imply a type of seeing that is enabled by the machine but also in relation to it. This calls for a more complex understanding of the role of the camera apparatus used in decision-making processes. Drawing on Niels Bohr's use of apparatuses in quantum physics experiments, Barad (2007 p.142) recognizes that they are not "passive observing instruments; on the contrary, they are productive of (and part of) phenomena". If we apply this to photography, we can see how the camera as a viewing device, the photographic frame both in the viewfinder and as the circumference of a photographic print, the enlarger, the computer, the printer, and the photographer (who,

in many instances, such as CCTV or speed cameras, is replaced by the camera eye), are all active agents in the constitution of a photograph. Many philosophers of technology agree that technological development is a goal-oriented process and that technological artefacts have certain functions so that they are more suited to certain applications but not, or less effectively, for others. This conceptual connection between technological artefacts, functions and goals makes it hard to maintain that technology is value neutral. Even if this point is granted, the value-ladenness of technology, particularly in photography, can be construed in a whole host of processual and interpretive ways. Cultural and political approaches, usually influenced by developments in Science of Technology Studies, adopt the idea that technologies contain a script that influences not only people's perception of the world but also human behaviour, and the idea of the absence of a fundamental distinction between humans and non-humans, including technological artefacts (Akrich 1992; Latour 1992, 1993; Ihde & Selinger 2003). The combination of both ideas has led some (James Moor, 2006) to claim that technology has (moral) agency. The debate about moral agency and technology is now particularly salient with respect to the design of intelligent artificial agents, including those used in technological photographic practices. This claim suggests that technologies can autonomously and freely 'act' in a moral sense and can be held morally responsible for their actions. The authors who claim that technologies (can) have moral agency often redefine the notion of agency or its connection to human will and freedom (e.g., Latour 1993; Floridi & Sanders 2004; Verbeek 2011).

To what extent we truly have autonomy and freewill in our intentions and decision-making processes when a photographer works *with* camera technologies is questionable when our visual field is defined by the ideological apparatuses[13], pre-set programmes and

[13] Following Flusser's definitions, apparatuses are not tools, *machine* is used to denote the camera itself, and apparatuses are the cultural network, framework or system of intentions hiding behind the camera (in film theory this would be called the *dispositif*). However, if the camera is deemed a machine - since it is automated, constant and therefore objective - it suggests the photographer is merely an operator and this then leads back to the problematic acceptance of photography as a fine art.

specifications of the camera and lenses making the photograph. Vilém Flusser (1989) has written extensively about how the photographic apparatus operates in ways that are not immediately known or shaped by its operator. He builds on the Latin origins of the term *apparare*, 'make ready for' which leads him to read photography as facilitated by the nexus of image-capture devices, various chemical and electronic components and processes, as well as sight (Zylinska, 2016 p.207). At the most basic level, the average camera is monocular and framed and these standard specifications dictate the visual field for the photographer and the subsequent reading of the photographic image. The person using a camera might think that they are operating its controls to produce a photograph that shows the world the way they want it to be seen, but it is the pre-programmed character of the camera that sets the parameters of this act and it is the apparatus that shapes the meaning of the resulting image. A close reading of any photographic artifact reveals the traces of the image making apparatus and some of the environmental conditions the photographer works within, which affords a direct insight into the relationship between affect and effect, seen in the subsequent photographic image.

Recent scholarship in the discipline of technology and culture considers that technology is an active agent in its own formation. A major thread in Don Idhe's post-phenomenology is material hermeneutics: the importance of artefacts in interpreting objective reality. In philosophy of technology and material hermeneutics studies it is generally considered that technologies transform our experience, perceptions and interpretations of our world, and we, in turn, become transformed in this process. These transformations are non-neutral (Ihde, 2009). Verbeek (2005a) describes what Ihde (1990) brings to light, that technologies can create a "technologically mediated" intentionality, a relationship between humans and a world in which their mutual constitution is mediated by technological artefacts (p.140). Ihde indicates that technology has "intentions"—they actively shape people's relations with

their world (Ihde 1990 pp.141–143). Technological artefacts tell us how to use them based on their physical appearance and internal workings. "When technologies are used, they co-shape human-world relationships: they make possible practices and experiences, and in so doing, they play an active role in the way humans can be present in their world and vice versa." (Verbeek 2005b p.140 in Tripathi, 2017). Technologies thus constitute a new reality, a new objectivity. It follows that if perception is technologically mediated, and never objective or neutral (no matter how automated the camera), this means that some degree of decision making is made in relation to other intentionality's, ideologies and parameters of not only the camera apparatus but in the interaction with each and every actant in the relational meshwork at play.

Just how does photography materially interact with other material phenomena and how do these interruptions, entanglements or comings-together reveal new qualities of photographic materiality itself? By materiality, I refer to the term drawn from material culture studies across contemporary cultural anthropology and archaeology, and refers to the domains of things, objects and matter; the properties, forces and energies of the materials and of the environment, that play an active (affective) role in the development of the human cognitive architecture (Malafouris, 2013), as well as human creative and technical activity (Ingold, 2000, 2011; Hodder, 2012). Materiality also refers here to a decision to focus upon the materials of engagement, such as the processes of production and their subsequent power relations, the invisible workers who build components, and the otherwise black-boxed complexity of interactions that make the photographic event possible (Lange-Berndt, 2015). To unpack such a black box is to unpack the internal complexity of technical processes that are made opaque by their own success (Latour, 1999). Physicist and philosopher Karen Barad's (2007) concept of agential realism and intra-action are particularly useful for understanding the materiality of the photographic apparatus and its event and its consequences for knowledge practices such as photography.

In the terms of New Materialism, matter is central and can be considered the 'dynamic and shifting entanglement of relations rather than as a property of things' (Barad, 2007, p.35). These entanglements are referred to by Barad as 'intra-actions' that address the particularities of power imbalances within complex fields of agency (2007, p.55). It is in this sense that matter become political. As an aspect of agential realism, intra-action reworks how causality might be conceived in that distinct agencies never pre-exist as discrete, atomic individuals with determinate boundaries, but rather emerge through, their intra-action (Barad, 2007). Rather, as the quantum experiments that prompt Barad's account demonstrate, not even atoms are 'atomic' entities prior to their measurement or observation but emerge as either particles or waves only *intra*-actively" (Gamble and Hanan, 2016 p.266). Barad's concept of intra-action provokes us to think about 'agencies of observation' and as a consequence helps move us away from the belief in representational models of the world and the idea that the world is somehow separate from the photographer. The view that we cannot have access to an observer-independent reality, means that we must accept that our thinking and knowledge practices like photography lack a solid foundation. When the camera apparatus captures a picture of the world it is not just recording the conditions of the camera but also conditions of the world that are enacted through the camera. Any mode of observation will shape the behaviour of the world for the observer – be that a human or automated camera.

Attempts to address technologically mediated perception, objectivity and instrumental rationality can be found in Flusser (1989) Ihde (1979) Bennett (2005; 2014) Barad (2007) and Haraway (2003) who introduce theories which set the ground for a more complex notion of an apparatus. These perspectives are consistent with historic film theory which understands the entire cinema experience as the *dispositif* – the film negative, the camera, the projection, the experience of viewing - the entire complex orchestration of elements in which film is technologically, culturally and ideologically forged. French philosopher Jean-

Louis Baudry first developed the concept of the *dispositif* in his two essays, *Ideological Effects of the Basic Cinematic Apparatus* (1970) and *The Apparatus: Metapsychological Approaches to the Impression of Reality in Cinema* (1975). Baudry analysed the ideological impact of cinema's *dispositif* and the specific 'cinema-effects' it has on the spectator. His concern was that classical cinema involves certain forms of deception by concealing its material origin. In Baudry's view, the impression of reality created by classical cinema is the result of an ideological articulation determined to hide the representation processes that film production implies, as if cinema could deliver truths about the world with no intermediary whatsoever. Cinema's *dispositif* thus has a material component which examines the basic apparatus and the particular set of technologies - the camera, celluloid, photographic registration, projector etc., and conditions of projection - the darkened room, hidden projector, light from the projector hitting a screen, immobile spectator, etc. The meaning of a film, plus the way the viewing subject is constructed and the mechanics of the actual process and production of making the film directly affect the representation of the subject and produce an impression of reality that shapes the way the audience think. For Baudry this *dispositif* was an ideological device whose origin lies in the bourgeois desire to dominate, a desire that pervades film images. Ultimately, this urge to dominate causes an ideological blindness, a fetishist alienation (Parente and Carvalho, 2009).

The concept of the *dispositif*[14] derived in part from Marxist film theory, semiotics and psychoanalysis, later became hallmarks of the English equivalent 'apparatus theory'. The psychological, spectatorial and ideological aspects were extended through theorists such as Christian Metz (1974), Jean-Louis Comolli (1971,1972) Teresa de Lauretis and Stephen Heath (1980) Peter Wollen (1987) and Giorgio Agamben (2009). The influence of psychoanalysis and Marxism were evident in Louis Althusser's (1971) perspective on

[14] Outside of film and media theory the *dispositif* also had wider reach in the writing of French philosopher Michel Foucault (1978) who adapted the term to discuss the technical media of discipline, security, and governmentality.

mirror misrecognition and the role it plays in forming identities. Whilst feminist theorist Laura Mulvey (1975) argued that the cinematic apparatus of classical Hollywood cinema put the spectator in a masculine subject position, with the figure of the woman on screen as the object of desire and the male gaze.

As yet, this idea of the *dispositif*, which has tremendous currency in film theory, has not been addressed in photographic theory. A photographic *dispositif* would attempt to address the photographic process as a complex event that is based on specific historical, medial, technological, material, social, cultural, and aesthetic conditions, including the potential to disturb and modify these very conditions. As image making technologies have become more complex and technological progress has condensed and accelerated the photographic process, it has become more apparent that although humans and their intentions participate, they are not the sole or necessarily the most profound actant in any assemblage. Although, as Jane Bennet (2005 p.463) states, "there was never a time when human agency was anything other than an interfolding network of humanity and nonhumanity […] what is perhaps different today is that the higher degree of infrastructural and technological complexity has rendered this harder to deny". Bennet asserts "if one looks closely enough, the productive power behind effects is always a collectivity" (ibid). However, this new ontological monism - that all things are interconnected – signals the importance that technology requires an ethics in which responsibility is the central imperative. Having entered the era of telecommunications where image producing, distributing and consuming technologies are becoming ever more decentralised and covert it raises important questions such as – does the acknowledgment of the agency of nonhuman actants relieve individual humans of the burden of being held responsible for their actions?

Jane Bennett (2014 p.464) pleads that what is needed is not only a "distributive understanding of agency," but also the ability to detach "ethics from moralism, and to

produce guides to action appropriate" to our interconnected world. In a world where agency is distributed, a hesitant attitude toward assigning blame becomes a virtue. Instead, this is a move away from the question of who to blame or who to hate and a move toward the question of responsibility--not responsibility as in who is responsible for this or that event, this or that horrific act, but responsibility as in our "increased ability to respond to the other, as well as others". "Response-ability," as Karen Barad (2007, p.392) calls it, is what happens when you understand the world to be made up of entangled agencies and power imbalances. To understand one's own response-ability is to move toward the "possibilities of mutual response" through embodied and human/post-human practices (ibid). Barad explains that to be more responsive to others is to do experimental "collaborative research" that puts us materially "in touch" in human and posthuman ways, enabling an increased reponse-ability through these new modes. For Barad, in the end, this is a matter of morality. This is truly "an ethics of worlding" that starts from a relational, situated and embodied model of (inter)subjectivity, and that reveals how ethics, being, and knowing no longer can be separated (ibid).

(iii) Distributed nature of cognition and human action

The insights that derive from the discussion of distributed cognition have until now not featured in the main body of photographic literature. However, introducing this discussion allows us to talk about photography, and especially computational photographic practices, in a way that extends or at least reposition the human as the primary causal agent. It enables us to think through photographic practices in terms of distributed agency that remains within the influence of the human while extending causal determinants in a dynamic meshwork that embraces non-human actors. In this thesis cognition is considered to be distributed when it is, in some way, *spread out* over the brain, the non-neural body and (in many paradigm cases) an environment consisting of objects, tools, other artefacts, texts, individuals, groups and/or social/institutional structures. Advocates of distributed

cognition (Hutchins, 1995; Zhang and Norman, 1994) argue that a great many cognitive functions such as reasoning, perception, emotion, are spread out in this way and this position is useful in order to reconsider the apparatus and in identifying the opportunities for the digital to flatten social and political hierarchies. Discussion of non-human vision and cognition are valuable here and there is a substantial body of work extant and emerging that considers this (Paglen, 2016; Bridle, 2018 Tuescher, 2019). The discussion is extended to include aspects of computational modelling of neurological systems (neural networks and machine vision) through Katherine Hayles (2017) who breaks with anthropocentric views of cognition with a framework that enmeshes biological and technical cognition. Hayles perspective offers a paradigm shift in how we think in relation to planetary cognitive ecologies, how we analyse the operations and ethical implications of human-technical assemblages, and how we imagine the role that the arts and humanities can and should play in assessing these effects.

My claim is that models of distributed cognition can be taken as a central starting point to think through photographic practices. As an example of this, chapter five offers an account of the networked nature of cognition through a close reading of Kees Molkenboer's contact prints of football matches. Within the meshwork model we consider how the environment of human and non-human entities, the variables of the technology or apparatus entangles with the other infinitely extendable meshworks like human cognition. Cognition is not entirely the result of a neurological process it is rather something that emerges between the body and the world in a reciprocal affective relationship.

In calling for a relational ontology of photography it is important not to deny the photographer's artistic or social intention and processes of decision making towards a particular aim or visualisation. Even if a photograph was produced accidentally, where intention was not related closely to the image, there will have been some level of action,

perception and skill deployed in composing the scene and a timely decision to depress the shutter. Yet, even in these most candid photographic practices, the classic romantic narrative spun around the flâneur street photographer tends to assign a disproportionate amount of intentionality and agency to the photographer (usually male), a lone genius who stands apart from the world and aestheticises it, as if viewing it through a window. These anthropocentric narratives tend to frame photographers as autonomous entities roving about the world with their superior vision and reflexes. This is captured in a frequently quoted passage by Susan Sontag:

> The photographer is an armed version of the solitary walker reconnoitring, stalking, cruising the urban inferno, the voyeuristic stroller who discovers the city as a landscape of voluptuous extremes. Adept of the joys of watching, connoisseur of empathy, the flâneur finds the world picturesque (1977, p.55)

Yet there are other ways of talking about creativity, intentionality and decision making in the practice of photography, especially since the altered role and agency of the photographic medium today calls for a new understanding of photography beyond its traditional humanist frameworks and perceptions. This critique of Sontag and the flâneur street photographer, drawing on feminist materialist approaches, opens the way for discussions of meshworks and new materiality to contribute to the re-calibration of this kind of photographic myth.

Considering the amount of photography literature that address the 'eye' and the 'mind' in their titles, there is a surprising lack of discourse that explores the relationship between photography and cognition.[15] Not surprisingly, the scant literature that does exists focuses the discussion on photography and visual experience, giving hierarchy to vision, and these

[15] Titles such as *The Mind's Eye* (Cartier-Bresson, 1999); *The Photographer's E*ye (Szarkowski, 2007); *See the Light: Photography, Perception, Cognition* (Salvesen, 2013). *Thinking Photography* (Burgin, 1982); *The Edge of Vision* (Rexter, 2009); *Street Photography: Creative Vision Behind the Lens* (Jardin, 2017) name just a few.

observations tend to be accompanied by problematic perspectives in the field of cognitive psychology, neuroscience, and art history. More recently there has been a sudden emergence of neuro-aesthetic approaches to understanding media (Barbara Maria Stafford 1999, Patricia Pisters 2012, Salvesen et al 2013) that attempt to build as aesthetic account of the medium based upon current neuroscientific findings. Neuroscientific methods for understanding cognition and the dynamics of the creative process use limited models taken from cognitive psychology that place the human brain at the center of all activity. The problem that arises is that, if you see human cognition as a discrete entity in the world, not part of the world, then of course you have a completely different vision. The problematic neurotypical image of the human devalues ways of being moved by and moving through the world, in particular, what Erin Manning (2103) calls 'Autistic perception'. Autistics explain that, rather than immediately distinguishing objects - such as chairs and tables and humans - from one another on entering a given environment, they experience the environment as gradually taking form. Manning maintains that this mode of awareness underlies all perception. What we perceive is never first a subject or an object, but an ecology. From this vantage point, it is proposed that cognition is not entirely the result of a neurological process; it is rather something that emerges between the body, material objects and the environment in a reciprocal, emergent, affective relationship. This gives us some insight into the collaboration between two different systems – neurological and environmental.

The first hurdle to overcome in understanding a distributed process of cognition and creativity in the practice of photography, is to remove the hierarchy of the eye and brain as the centre of all activity. A number of theorists from fields of philosophy (Noë, 2004; Merleau-Ponty, 1948, 1962) psychology (Gibson, 1979) and cognitive science (Varela *et al.* 1991), build an ecological model of vision that does not prioritise the eye. In recognising the limited capacity of the physical structure of the eye to experience the richness and detail

of the world – evidenced in the eye's 'saccade' motion which shifts focus two or three times second – they state visual perception is dependent on the sensory-motor knowledge of the entire body acting and moving in the world, a knowledge that is practical (Noë, 2004 pp.36-40). Cartier-Bresson seems to understand this reciprocal relationship from first-hand experience:

> Sometimes a single event can be so rich in itself and its facets that it is necessary to move all around it in your search for the solution to the problem it poses – for the world is movement, and you cannot be stationary in your attitude towards something that is moving. (Bresson, 1952, p.3)

Situated approaches to understanding cognition have come to challenge the traditional cognitivist paradigm which claims the locus of cognition as belonging intrinsically and only to the human mind and body (Heersmink, 2017). Situated cognition is a form of cognitive extension that can be expressed in a multitude of ways through engagement with a person's external environment, influencing how a person perceives, learns, knows, reasons, decides, and acts (Overman and Malafouris, 2017). Within the generic term 'situated cognition' are various distinctions in which cognition is embodied, embedded, extended, distributed, dynamical, or enactive. At its core, situated approaches consider human thought as *affected* by the external socio-technological environment (Hutchins, 2014). Hence, when the external environment changes, the individual's cognitive abilities are also impacted. These thoughts had already been articulated by Merleau-Ponty in 1968 in his theory 'the flesh of the world' which talks of the interconnectedness of everything. He describes how the body extends beyond itself, reaching into the world which it is already a part of and therefore the "intertwining" of thought to *being and acting* in the world. Merleau-Ponty claims:

> thought is a relationship with oneself and with the world as well as a relationship with the other; hence it is established in three dimensions at the same time. And it must be brought to appear directly on the infrastructure of vision. (Merleau-Ponty, 1968, p.145).

The de-centered relationship of intertwined flesh dislocates and dissociates the traditional categories of subject/object, human/world, inside/outside, and importantly, each takes on attributes of its binary 'other' (ibid).

Extended cognition (Clark and Chalmers, 1998) sees the mind as externalising many of its functions by recruiting and incorporating the resources and processes of the physical world. For example, functional limitations in the way human memory works (e.g., its capacity, perishability, and privacy) have motivated the use of physical artefacts (such as cameras and memory cards) to accumulate, store, and share its contents (Overman and Malafouris, 2017 p.3). A related and rapidly growing line of inquiry is the anthropology of technology (or digital anthropology), which examines the issues inherent in the relations and interactions between individuals and technologies as they form increasingly complex systems and networks. The work of Lucy Suchman (2007) and Don Ihde (1990) explore the idea of agency at the interface between humans and machines: who has agency, how agency is constituted, and how agency changes through creative and interactive processes. Similarly, the anthropology of technology investigates the ways in which minds and bodies change when they incorporate devices or technical processes that enhance the psychological abilities and physical capacities of mind and body.

There are many grounds on which to claim that creativity and decision making is a distributed action. The common misconception is that creativity has to do only, or mainly, with generating new ideas, something that is supposedly taking place in the head or brain, and what happens after this point, the 'implementation' part, is of less concern. A view of distributed creativity, drawing on cultural, social, technological and material interactions challenges this reduction. Distributed cognition views the mind and knowledge as involving resources and processes in networks of interacting agents and objects whose collaboration produces results beyond what any one individual could realise alone. Rather

than being viewed as an individual property, cognition is approached as a social phenomenon that is situated in practices of knowledge and problem solving and that leverages social and material resources as mechanisms for sharing knowledge, collaborating and coordinating effort, and task decomposition and decentralisation (Zhang and Norman, 1994). An example of this is given in a chapter five through an account of a helicopter cinematographer working as one component within a large and complex meshwork of human, technological and problematic environmental conditions to produce live footage of a marathon race.

Certain theories that address non-human agencies have begun to force an awareness of the distribution of cognition and to rethink the balance of agency and authorship in photographic practice. Across disciplines there is widespread agreement from system theorist Gregory Bateson (2000, 2002), psychologist James Gibson (1979), philosophers Heidegger and Merleau-Ponty to anthropologist Tim Ingold (2010; 2011; 2013), archaeologist Lambros Malfouris (2013) and architect Juhani Pallasmaa (2015) that humans think through material culture. Lambros Malafouris's Material Engagement theory (2013) and Jane Bennet's (2010) distributive understanding of agency open the pathway to rethinking human cognition in response to a dynamic world of materials and forces that want to do their own thing. Philosophers Gilles Deleuze and Félix Guattari argue that the essential relation, in a world of life, is not between matter and form, or between substance and attributes, but between materials and forces. It is about the way in which materials of all sorts, with various and variable properties, and enlivened by the forces of the Cosmos, mix and meld with one another in the generation of things (Deleuze and Guattari 2004 p.377). If we stop to think of all the materials and forces from photons and chemical reactions to mirrors and prisms and pre-set programs that constitute the practice of photography, we see how the photographer's decision-making is infinitely entangled with non-human agencies that have their own determining forces. Neither materials nor

technologies are passive, each has its own way of being, its own resistances, tolerances and temporalities, and these create limitations and affordances that can either work with or against the photographer's intention during a photographic event. Using a camera is a constant process of negotiation as the conditions and animism of materials and the world constantly throw up challenges to overcome. These are the moments where materials or environmental conditions push back against the photographer's intention i.e. a sun flare, a malfunctioning camera, too much film grain/noise in dark conditions. The writing of Monroe Beardsley (1965) recognises the creative process generates its own direction and momentum. There is no such thing, for Beardsley, as a single guiding factor (or a single creative pattern of control) that results in a work of art, rather creativity is a self-corrective process, both conscious and pre-conscious, between the artist and the work, a constant re-direction of aims that emerges through the activity of the artist with their materials. Any 'control' of the outcome of the work is neither determined by the 'means' or the 'end' in the mind of the artist, or within the materials being used, rather 'control' is internal to the process itself (Beardsley, 1965, pp.298-299). The final form of the artefact cannot wholly be attributed to the intention - from the mind of the maker, but rather emerges as an expression of a total 'field of forces' set up through the structured movement of the practitioner engaging with the tensions and resistances of materials. What Ingold (2010, p.345) describes as the 'growth' of a human artefact is seen more as a process of *autopoiesis:* a self-transformation over time of the entire system of relations that comprise the organism-environment system in which the artefact comes into being. If agency in the photographic process is distributed amongst all the actants in a meshwork, that the photographer is part of, then it is necessary to understand the photographer's process of cognition and decision making as distributed but also responsive in relation to these actants. Thinking about photography in this way recalibrates the "moment of acting" (the decisive moment) into a model that recognises a distributed nature of human cognition and action into the material world of things.

1.3 Conclusion

The review of literature presented in this chapter sets up a framework for the case studies in chapters four, five and six which make a media archaeological analysis of three different contact sheets. Prior to this, the next chapter will discuss Henri Cartier-Bresson's notion of the 'decisive moment' – a key concept that has underpinned documentary and photojournalist practices – in order to show the possibility of rethinking the photographic event in a non-anthropocentric way.

Chapter Two: The Deceit of the Decisive Moment

The previous chapter offered a relational ontological account of photography that suspends patterns of photographic use as they have been institutionalised or delimited to a genre. It then introduced new materialist theories, helpful for shaping a framework by which we can read more closely the different shifts in balance of collaborative determinates during particular photographic moments. This chapter builds on these previous discussions to examine meshworks of collaboration in the representation of 'a moment' in documentary photography. It does this to question the innate anthropocentricism in art historical narratives that suggest that photographic artefacts are reducible to a single 'decisive' author. By rethinking the approach of a key figure in the history and theory of documentary photography – Henri Cartier-Bresson's pervasive 'decisive moment' - it brings into question the rather oversimplified, orthodox understanding of his process which praises the acuity of the all-intentional photographer and his superior reflexes. Cartier-Besson's declaration of his philosophy of photography in his book *The Decisive Moment* (1952) became an influential text that still continues to shape generations of documentary photography and photojournalism. However, the book's emphasis on personal vision deflected attention away from the highly collaborative aspect of his practice. To address this oversimplified understanding of documentary photographic practice this chapter provides a focused case for the efficacy of the 'decisive moment' as a counter argument to the relationality of the photographic act between human, non-human and world.

This chapter argues that the 'moment' in documentary photography may be better understood as a complex and attenuated process. It does so by drawing attention to some of the neglected determinants that are omitted from Cartier-Bressons' account. The first section discusses the significant political, social and technological ecology of determinants

prompting Cartier-Bresson to modify his camera in the development of his photographic approach. In doing so it begins to offer some ways of thinking about the relations, processes and contexts that shape and mediate making. The second part of the chapter tells the story of how photography was integrated with contemporary art practice through a series of discrete theoretical moves from auteurism to an acceptance of the use of chance as a creative strategy. Gradually, towards the 1970's, chance and contingency were incorporated into art historical discourse and theory and understood as processes that were actively used by the photographer. However, this use of chance was only ever presented in a way that retained the artist's mastery of it. The influence of these key factors reveals how Cartier-Bresson's practice was a co-production and certainly not reducible to a single 'decisive' author. Although this single author model might have been sufficient at its inception, photography's technological basis has changed, arguably becoming more complex and a thicker account that moves away from single authorship will, as we see in the following chapters, assist in demonstrating a continuity between film photography and new technological photographic practices.

As discussed in chapter one, a number of assumptions imported from art history. (1) that photography is a fundamentally human-centred practice (2) that photographic technology has a singular determining agency that is most often subordinated to the image (3) that reality is populated by fixed objects with boundaries, have underpinned the interpretation of Cartier-Bresson's work. They tend toward an instrumental framing of a photographer as a master of the machine, rather than as part of a processual agency of objects and actants. In general photographic discourse, the camera is conceptualised as an uncomplicated extension of the photographer's body, one that is simply a neutral relay of instinctive wishes and desires. Photographic history and theory continue this line of thinking, and overidentifies the process of capturing a fleeting moment with the artistic intentions of the

photographer, enabled by shrewd reflexes and superior vision, as if they are the sole agent in the photograph's production.

In order to challenge this line of thinking this chapter will first refer to the significant technological shifts in camera technology and prevalent intellectual trends around photography in the 20th Century. It will also make a rereading of Cartier Bresson's *The Decisive Moment* to show, this focus of attention on the photographer's intentionality overlooks the agency of other persuasive forces at play. Photographers themselves often recount in anecdotal post-hoc narratives how they managed, or didn't manage, many arbitrary, persuasive factors which influenced their decision making during a specific photographic encounter. These more modest accounts acknowledge the accidental and contingent occurrences where control was relinquished to the world. Typically, these post-hoc narratives serve to account for the veracity of the image, but they also disclose something of the complexity of a photographer's decision making within their working process, which is partly discernible in and affirmed by the photographic image. In some ways this is inconsistent with the trend in the dominant literature which places the intentional photographer as the central driver of the creation of photographic artefacts. The less discussed reverse aspect of this is that photographs can reveal how disinterested the world is in its own image. This draws attention to the importance of thinking about creativity and the decisive moment as contingent to a world that wants to do its own thing.

Henri Cartier-Bresson's photobook *The Decisive Moment* (1952) popularised the notion that the best photographs are made by the patient and gifted photographer who captures a fleeting moment with just one click of the shutter, creating an image with internal geometry and balance. The book solidified Cartier-Bresson's reputation as an artist working with a camera and it encouraged scholars, curators, and students to understand photography as the product of trained individual vision and talent. Yet the book's emphasis on personal

vision also deflected attention away from the highly collaborative aspect of his practice. Cartier-Bresson was not 'out on a limb'; he was a product of history and a particular historical moment, and the thesis takes the reception and theorisation of his ideas about photographic authorship as a paradigmatic and influential example of the way in which a human-centered model shaped thinking about the photographic apparatus and it's use. This chapter begins by shifting attention to the political, social, philosophical and technological meshwork that Cartier-Bresson operated within during mid-century. It does so in order to show how his 'decisive moment' was less likely sudden but actually the culmination of an attenuated process of political, social, cultural and technological intra-actions. Rethinking the decisive moment as a collaborative relational meshwork challenges the paradigm of individual and inspired creation.

2.1 The attenuated decisive moment

Most often iconic photographs are the manifestation of coincidences between simmering political, social, cultural or philosophical shifts and technological innovation. Following the Second World War, various technological and philosophical changes initiated new uses of photography that diverged from the orthodoxies of studio photography. This generated an appetite for rethinking photographic practice and its possible social significance.

With photojournalism at its peak during the early-to-mid 20th Century, the demand by magazines for photographers to record the events and people of the world grew tremendously. The rise of the mass circulation of picture magazines in the 1920's nurtured a general interest in documenting everyday human experience. The post war boom in publishing followed this trend and coincided with developments in camera technology. The introduction of portable cameras to the market made it possible for photojournalists to be amongst the action to capture the climactic instant, whether peak sports action or subtle emotional interaction. First there was the release of the miniaturised and portable 35mm

Leica (1925), then the Ermanox with its fast f/1.8 and f/2 lenses (6cm x 4.5cm format, 1924) followed by the medium-format Rolleiflex (1929), Contax range-finder cameras (1932) and the 35mm Contax (1936). Several innovations made the Leica camera in particular ideal for magazine photojournalism. Its small size, light weight, and quiet operation made it inconspicuous thereby giving a significant advantage to photographers who wanted to work surreptitiously. Its film cassette of thirty-six exposures permitted photographers to concentrate on moving subjects without having to reload after each picture. The Leica also allowed for faster lenses with larger apertures, which enabled photographing in low light without a flash. The most important innovation was the Leica's viewfinder, which allowed the camera to be held to the eye instead of at waist level or on a tripod. Photojournalists could easily track and photograph moving subjects, in addition, capturing spontaneity and naturalism was made more possible because the shutter was clicked before subjects realized they were being photographed (Cookman, 2009). These camera innovations revolutionised the practice of documentary photography and reportage, enabling quick and unobtrusive shooting in all conditions. The affordances of these new camera technologies supported the development of a new candid style of 'humanist photography' (Jay, 1978; Cookman, 2009; Pasi, 2012). Humanist photography was defined in two ways: first for its social or documentary record of human experience; and second, for its expression of humanist values such as empathy, solidarity, mutual respect and often humour (Smith 2005 p.43). Motifs like the street, the café, Paris and its sights, ordinary people, and the amorous couple, are all staples of the humanist image-repertoire that were contemporary concerns in post-occupation French society. The work of a variety of photographers, including Helen Levitt, André Kertész, Brassaï, Lee Miller, Robert Doisneau, Mary Ellen Mark, Willy Ronis, and Henri Cartier-Bresson, who documented this modern vernacular came to be evaluated primarily in terms of its humanist qualities.

At the time, the discourse of humanism served to resolve the inherent ambiguity of the medium, since photography was celebrated as a humanist medium on the grounds of its status as both objective, instrumental record, and medium of self-expression. Photojournalist Cornell Capa (1918–2008) chose the phrase 'concerned photographer' to describe those who demonstrated in their work a humanitarian impulse to use pictures to educate and change the world, not just to record it (International Center of Photography, 2016). Smith (2005) claims:

> while the documentary character of post-war photography looked back to the pre-war tradition of photo reportage as social documentary records of human experience, the expressive potential of the medium looked forward to the recognition of the photographer, usually an editorial freelancer, as an auteur on a par with other artists (p.44).

As a consequence, the international humanist photography movement was a significant factor in the recognition of photography as an art form. However, there are many postmodern critiques of humanist photography. These are mainly associated with documentary photography and claims as to its ability to produce objective representations. This concern has raised debates around functionalism versus expressionism, representationalism verses symbolism, objectivity verses subjectivity, purism verses pictorialism, issues which are further exacerbated by the fact that photographs are interpreted, misused, edited and manipulated. Whilst humanist photographs were considered to be documents of reality, this reading leaves little room for the interpretive power of the images. Where does the hand and mind of the artist meet with the flash-in-the-face approach of the newspaper photojournalist recording a road traffic accident? A problem for post war photography was how could a technical instrument be reconciled with humanist values. How might the camera apparatus might be used in such a way as to effectively convey the values of the movement, and not simply to create tropes, stereotypes and clichés that conveyed humanist concerns?

As a celebrated photographer from this movement, Henri Cartier-Bresson did much to change the nature of photojournalism and address the aforementioned concerns**.** He made a significant intervention at two levels: the first, in his modification of the photographic apparatus and the second, with his sympathetic working method as a photographer. Cartier-Bresson was largely uninterested in technical details of the medium, his original interest and passion was painting, but his use of the camera showed modern photojournalism a new approach. Combining his affinity for the disciplined painting of the great masters with his interest in Surrealism and modern philosophy, in addition to a desire for travel and immersion in the thick of current events, he used photography to create visual documents with seemingly remarkable spontaneity that brought together the two possibilities of photography: art and visual documentation (The Art Story, 2019).

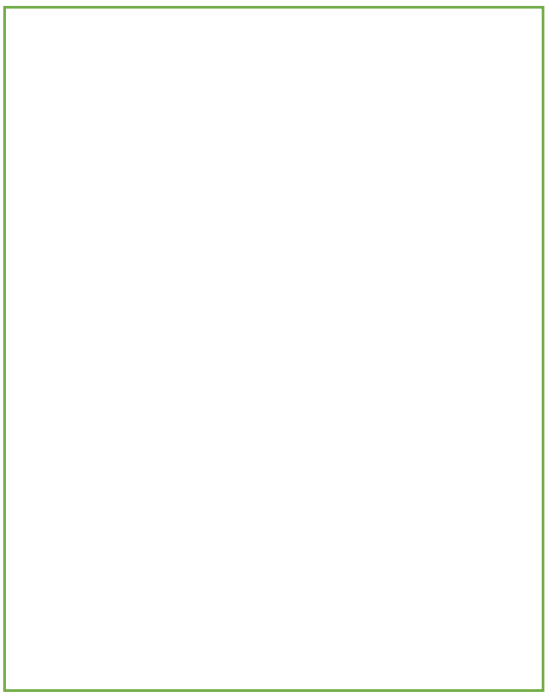


Fig.2 book cover designed by Henri Matisse. Henri Cartier-Bresson, *The Decisive Moment*, 1952, New York: Simon & Schuster has been removed due to Copyright restrictions

One of the key texts that emerged from this movement was Cartier-Besson's book *The Decisive Moment* (1952) which featured 126 photographs divided between his work in the 'Occident' and his post-war work in the 'Orient'. The images were arranged chronologically, presented without captions and in very large format (some as large as 14 inches × 20 inches), between a jacket cover designed by Henri Matisse. The book serves as

a declaration of his philosophy of photography, both visually and in his introduction, a lengthy statement on photography by Cartier-Bresson himself – a relatively rare feature for photography books at the time. Beginning with a biographical account of how he began taking and developing pictures, the fourteen-page essay offered Cartier-Bresson's theories and practical considerations on working with a camera. In sections subtitled 'the picture-story', 'technique', and 'the customers', which together constitute over half of the introduction, Cartier-Bresson described photography from the perspective of a 'photo-reporter', calling himself an 'artisan' who delivered 'raw material' to the illustrated magazines (Blair, 2016). He covered captioning, picture layout, and film editing, and acknowledged that magazines and their staff were instrumental to circulating and publicising his work. Cartier-Bresson's detailed exposition of the photographic process from beginning to end was exceptional at the time, and this contributed to the pervasive and persistent influence of his ideas.

2.2 Camera as a humanist instrument

Cartier-Bresson's particular approach to photography was greatly enhanced when he bought a Leica in 1932 and became a purist in its service, consumed by the possibilities afforded by this more discrete camera as a new art form. Earlier large-format cameras used holders with only two sheets of film which meant photojournalists commonly staged their pictures and often used pictorial conventions from painting to compose their subjects. Capturing action was difficult and rarely attempted or successful with old view cameras mounted on tripods and bulky hand-held press cameras such as the Graflex (Cookman, 2003). The Leica camera was new to the market and its small size and portability helped facilitate the impromptu nature of Cartier-Bresson's approach to photography, allowing him to act quickly to capture candid images of his subjects without being overly intrusive. To enhance his capacity to take the kind of candid shots he preferred, and to help create an aesthetic that accorded with humanist values, Cartier-Bresson often wrapped his Leica

camera in black tape to make it less obtrusive. It isn't clear whether he considered this obtrusive for the photographed human subject or because the metal, glass and logos on the camera body tend to hover over any subject behind reflective surfaces and consequently become part of the resulting image.[16] Cartier-Bresson articulated his ethic, and unobtrusive approach in the introductory preface to his book: "We are bound to arrive as intruders," he wrote. "It is essential, therefore, to approach the subject on tiptoe – even if the subject is a still life […] It's no good jostling or elbowing." (Cartier Bresson, 1952 p.5) As part of his concern for being unobtrusive, he rejected artificial lighting. "And no photographs taken with the aid of flashlight either, if only out of respect for the actual light – even if there isn't any of it. Unless a photographer observes such conditions as these, he may become an intolerably aggressive character" (ibid).

Through this approach it seemed Cartier-Bresson was attempting to use the camera to reproduce the world as it could be candidly observed, as opposed to constructing staged images that functioned to represent humanistic values through symbolic formulas and pictorial tropes. He was clear about what he wanted the camera to do. Like an anthropologist, and in direct contrast to the pace and constraints imposed by the press, he carried out a number of international surveys focused on certain themes such as ragged men and women asleep on the street; children crying in a crowd; dark-skinned boys playing naked on the cracked earth; girls with plaits selling fruit (Hamilton, 1997). The compositions are cluttered, the grey tones undifferentiated, clouds and atmosphere rarely visible; the photographs seem only to exist in order to show these people in their habitat.

This candid observation made use of changes in camera technology. He tended to stick to three fixed (prime) lenses 35mm, 50mm and 135mm, which enabled him to respond

[16] Experience as a photographer photographing reflective surfaces in museums has led me to cover up camera logos with black tape to hide the presence of the camera. Cartier-Bresson never reveals the cameras presence or his own in the form of his shadow or reflection in his images.

quickly to the unfolding event having no need to change focal length and adjust focus. Prime lenses are prized by photographers for their specific characteristics, which are especially suited to portraiture. They have wider maximum apertures, which is ideal for isolating the subject, and they generally offer incredibly sharp image quality. Even at the time of the early Leica, Cartier-Bresson would have quickly understood how to exploit the affordances of these lenses. For example, the 50mm lens provides a field of view comparable to that of the human eye, and the wide maximum aperture makes shallow depth-of-field photography across a range of subjects possible. As the lenses were fixed in focal length, he would have had to use his feet to change composition. As Cartier-Bresson explains in his preface to *The Decisive Moment* (1952) "sometimes a single event can be so rich in itself and its facets that it is necessary to move all around it in your search for the solution to the problems it poses — for the world is movement, and you cannot be stationary in your attitude toward something that is moving" (p.3). The way in which Cartier-Bresson moves himself around his subject in order to arrange the composition he desires indicates how he needs to work *with* the world, and the limitations and affordances of the camera, to accommodate the accidents and agencies of other actors within the environment. His process demonstrates an aspect of agential realism, that proclaims the entanglement of relations – in this case his camera, chosen lens, the film, ambient light, his environment and himself - reworks how causality might be conceived in that "distinct agencies do not precede, but rather emerge through, their intra-action" (Barad, 2007, p33). The dynamism of these intra-actions is generative, not merely in the sense of bringing new things into the world (as a photographic reproduction of the world as Cartier-Bresson candidly observed it), but in the sense of bringing forth new worlds. As Barad (2007) might observe, Cartier-Bresson is "engaging in an ongoing reconfiguring of the world" (p170) and the camera technology and his photographic approach is wholly implicit in this. Yet, art history's narrow auteurist reading of Cartier-Bresson's approach and the legacy of the term 'the decisive moment' has disavowed any dynamic and processual theories of

materialisation which in many ways has contributed to a reductionist understanding of photographic practices.

2.3 The master narrative of the decisive moment

Cartier-Bresson's explicitly purist approach to his photographic practice did much to enhance the apparent spontaneity of his images and emphasised what he called the 'decisive moment'. The decisive moment, which can refer both to the content of the photographic image as well as to the moment of its capture, is most closely associated with his signature photograph *Behind the Gare St. Lazare* taken in 1932. Behind a railroad terminal in Paris a leaping man is frozen a millisecond before his foot splashes down in a huge puddle which perfectly mirrors the scene. Cartier-Bresson concluded his book with a succinct definition of what it meant to make a great photograph "To me, photography is the simultaneous recognition, in a fraction of a second, of the significance of an event as well as a precise organization of forms which give that event its proper expression" (Cartier-Bresson, 1952, p.14). He elaborated by explaining how he set up his shot, then lay in wait for something interesting to cross into the frame. He spoke often about his pursuit of the 'golden rule' when framing a scene (ibid, p.9) and implied that the best pictures could be judged with a ruler or diagrammatically asserting that "if the shutter was released at the decisive moment, you have instinctively fixed a geometric pattern without which the photograph would have been both formless and lifeless" (ibid). He was adamant that cropping of any kind was an admission of defeat claiming:

> If you start cutting or cropping a good photograph, it means death to the geometrically correct interplay of proportions. Besides, it very rarely happens that a photograph which was feebly composed can be saved by reconstruction of its composition under the darkroom's enlarger; the integrity of vision is no longer there" (ibid, p.10).

Cartier-Bresson also criticised photographers who used cameras with motors, like machine guns, mindlessly targeting their subjects and never choosing anything exact. He advocated "it's essential to avoid shooting like a machine-gunner and burdening yourself with useless recordings which clutter your memory and spoil the exactness of the reportage as a whole" (ibid, p.4). Instead the notion of the decisive moment hinged on the split-second instant when the attentive photographer saw a geometrically balanced scene and depressed the shutter just in time. Cartier-Bresson stressed "composition must be one of our constant preoccupations, but at the moment of shooting it can stem only from our intuition, for we are out to capture the fugitive moment, and all the interrelationships involved are on the move" (p.9). The decisive moment could be spontaneous and unexpected, catching the photographer by surprise, or it could be the climax of either a long period of waiting or a rapid succession of shots, but it always combined timing with formal balance.

Cartier-Bresson's theory legitimated the pictorial significance of the action photograph on both sides of the camera. Behind the camera, the photographer instinctually senses when the decisive moment has arrived, even if they are unconscious of the configuration of forms that their improvisation has recorded. In front of the camera, the decisive moment does not arrive by accident, but rather belongs intrinsically to the events unfolding. Cartier-Bresson's lucid philosophy and articulation of his process functioned as an effective summary of what the decisive moment meant. His statements were reproduced time and again even though it was one piece of a longer, multivalent treatise. In the seventy years since the publication of *The Decisive Moment*, his approach to photography has informed anglophone thinking about street and documentary photography, photojournalism, reportage and photographic theory (Peter Galassi 2003, 2010; Clément Chéroux 2015; Robert Delpire 2009; Geoff Dyer 2012; John Berger and Geoff Dyer 2012). His ideas and working methods have led to him being titled a genius and dubbed *l'oeil du siècle* (the eye of the century) with art critics and journalists (Kimmelman, 2004; Glassai 2010; Nabokov

2010). What the decisive moment did above all was enshrine the term in the collective photographic consciousness, shaping several ensuing generations of photographers. As Blair (2016) states:

> Almost immediately, the decisive moment became a powerful mythology for the history of photography. By insisting that great photographs are the result of the photographer's trained instincts, attention to the surroundings, and preoccupation with composition, Cartier-Bresson reconciled the haphazard nature of photography – the uncomfortable reality that even an untrained operator could accidentally make a great photograph – with its claims to art, which implied consistency, effort, and skill (p.148).

By explaining that the camera functioned as 'an extension of the eye', Cartier-Bresson, like many photographers of his generation, asserted mastery over the camera by integrating it into the realm of physical reflex. He writes "the photographer composes a picture in very nearly the same amount of time it takes to click the shutter, at the speed of a reflex action" (Cartier-Bresson, 1999 p.33). In response to the pace of modernity he suggests the photographer's cognitive faculties have accelerated to make perception and judgement instantaneous. However, Cartier-Bresson's hyper description of his approach and the legacy of the term 'the decisive moment' has in many ways contributed to a reductionist understanding of photographic practices which has had wide consequences. In the catalogue to an exhibition of Cartier-Bresson's early works of 1932-34 held in New York in 1987, Peter Galassi refers to the title *The Decisive Moment* as 'an over-simplification' and tells us that "Cartier- Bresson's photography is celebrated as the expression of an intuitive talent beyond the reach of historical analysis" and "is classified as an exemplar of an anonymous formal principle: the capacity of the small, hand-held camera to seize a telling picture from the flux of life" (Galassi, 1987 p.9).

The original title of Cartier-Bresson's book– *Images on the Fly*– may offer a clue in how we could address this reductionist understanding. The next section will discuss its implications

to suggest Cartier-Bresson's work leads the way to thinking about the relationship between the photographer, the apparatus and the world in an integrated way.

For the epigraph to his book, *Images à la Sauvette* (1952), directly translated as 'images on the fly' or more loosely as 'stolen images', Cartier-Bresson borrowed a phrase from the memoirs of the 17th-century Cardinal de Retz "There is nothing in this world which does not have its decisive moment". The American publisher Dick Simon of publisher Simon & Schuster hesitated to use a translation of the original French title and opted for something punchier for the English edition - *The Decisive Moment* (Foundation Henri-Cartier Bresson, 2017). This title quickly became a fabled term and an influential approach for generations of photographers. Typically, when 'the decisive moment' is used in the appreciation of Cartier-Bresson's work, it is misunderstood to mean that he chose the 'right' moments as if *he* was the only acting agent in the production of the photograph. It's precisely this misinterpretation that has prevailed and become his legacy. While the title *The Decisive Moment* is an editorial construction, which suggests the mastery of an all-intentional photographer, 'stolen images' implies the photographer steals the image from the world, which is doing its own thing, and 'images on the fly' invokes that his fugitive approach to photographing, which gives agency to the camera, may result in the imperfect capture of his subjects that likely does not follow pictorial norms. As Gaby Wood (2014 p.24) points out, "the two titles could hardly have been more different, the French suggesting the gleeful, furtive takings of a man on the run and the English version implying a haughty academic precision". If you proceed from the original title of Cartier-Bresson's book *Images on the Fly*, this leads to a very different understanding of Cartier-Bresson's working process. In fact, Cartier-Bresson always emphasised the importance of composition, and liked to "instinctively fix a geometric pattern" (ibid) into which a chosen subject fitted. The idea that he lay in wait for someone to walk into a precomposed frame may explain his

extraordinary hit rate – but it also runs contrary to the French title, which suggests exactly the opposite.

The human-centred selectivity about the way photographic processes have been discussed inhibits other interpretations of how photographs come into being. For instance, when Cartier-Bresson 'instinctively fixes a geometric pattern' he has agency in composing the whole scene however he relinquishes that agency at the last second and allows contingency and chance to offer up the final feature in the composed frame. In surrendering an element of the image making process to the world he practices an approach to making that Tim Ingold (2011) describes as "temporally stretched, between the *already* and the *not yet*. It seems that in every venture and at every moment, we are both fully prepared and yet utterly unprepared for things to come" (p.138).[17] As Ingold proposes:

> the assumed relation of temporal priority between mastery and submission which underpins the cognitive or intentionalist account of doing should be reversed. Thus, the leading edge of action, where it pushes out into the unknown, is a moment not of doing but of undergoing, not of mastery but of submission – a moment of exposure to a world that may or may not afford possibilities for carrying on (p.139).

2.4 Relinquishing agency to the camera

Although the dominant literature about Cartier-Bresson focussed on his genius, he had an intimate relationship with the camera apparatus. His purist approach; using prime lenses, allegedly never cropping, and his disinterest in a technically competent image, gives agency to the camera apparatus. Cartier-Bresson describes from his experience how the

[17] Ingold's description of the attenuation of time in the *already* and the *not yet* resonates partially but not completely with Barthes conclusion in *Camera Lucida* (1981) that every photograph contains the sign of its death, and that the essence of photography is the implied message 'that-has-been'. The photographic referent of *the thing that has been there* is the superimposition of reality, and of the past. However, the context of Ingold's description is in relation to the making process whereas Barthes context is the photographic referent "the place which extends between infinity and the subject (operator or spectator)" (Barthes pg.76-78).

consolidation of bodily instinct of the photographer accelerates the aesthetic faculty to the speed of a reflex by passing the deliberation of the mind. "don't think" he once advised. According to his argument, conscious mental processes cannot keep abreast of modern action, which must be captured in a "creative fraction of a second" (Cartier-Bresson, 1999 p.33). In finding some quality in the photographic process Cartier-Bresson reinforces the attention to the camera - using the apparatus in a way that lets the world speak for itself. This formalist approach reduces the authority of photographer, but then there was a profound contradiction when his own terms were modified by his editor in changing the title of his book to *The Decisive Moment*. The term 'the decisive moment' has become an adjective which describes a characteristic quality of reportage photography, yet *Images on the Fly* is a verb which favours thinking about his fugitive approach to his process. Fugitive image making relies on the camera apparatus and attending to its essential role in the process of image making offers a way to rethink the causal relationship between the photographer, image and world (this will be unpacked further in chapter four). This produces a tension between the autonomy of the apparatus and the traditions of connoisseurship which are usually focussed on the author.

Attending to the role of the apparatus in Cartier-Bresson's approach encourages a different approach to understanding agency in photographic practices. Explanatory commentary about documentary photographs, especially those that depict seemingly fleeting moments, focuses on the photographer's intent and their subtlety and acuity of vision.[18] This rhetoric can be traced to in part from Cartier-Bresson's account of his "velvet hand and hawk eye" (1952, p.7) suggesting that successful photographers might have superior reflexes and foresight. This focus on the intentionality of the photographer side-lines other

[18] This is particularly exemplified in the art historical discourse that try to uncover the working processes of street photographers (usually those from the Magnum agency) such as Williem Klein, Joseph Koudelka, Don McCullin and Elliott Erwitt, an example of which can be found in the DVD series *Contacts: La Grande Tradition du Photo-Reportage* (Arte Video, 2004).

determinants; randomness, accident and uncertainty. It also draws attention away from the extent to which the photographer works, to a greater or lesser extent, contingently *with* and *in* a dynamic world that has its own intentionality and temporality. Additionally, the limitations and affordances of the camera is crucial to the understanding that the apparatus too has its own agency which the photographer must negotiate in the production of the optimal photograph.

In revisiting the origins of Cartier-Bresson's Decisive Moment, and considering it as an attenuated process, his work leads the way to thinking about the relational ecology of photographic practices in a more even-handed way. It is the claim of this thesis that to truly understand how photographs come into being it is vital to understand the dynamics of the relational ecology operating in any given photographic 'moment'. The reciprocal collaborative relationship between all the acting agents – the photographer, camera apparatus and world - during the photographic process. The purpose of insisting on this is to open up the discussion of causality in chapter four. This discussion carries forward the argument by pointing to the effects of certain shifts in the weight of agency, particularly when the dynamics of the world realign the work and intention of the photographer.

2.5 Chance, mastery and skill

In rereading Cartier-Bresson's work with attention to agency it is possible then to critically respond to the understanding of the photographic image as momentary. Prevailing conceptions of photography's relationship to instantaneity and to the photographic image as a record of a brief and transitory moment in time are constitutive of both the means of production and through appearances in the photographic image (Green, 2006). Furthermore, by prioritising the singular image, photographic theory constructs a false causality that ultimately aestheticises the world, and in doing so it has neglected discussions of other human, object and material agencies that can run counter to the social intention of

the photographer. Conventionally, causality seems to be understood as a direct opposite of agency: a relation of cause and effect that is deterministic, predictable and not necessarily dependent on individual action. Using the term 'the decisive moment' privileges an assumed direct correlation between the photographic image and the world and deprives the process of the complexity in the causal relationship.

One consequence of the simplification of the causal relationship is that the dynamics of the multiple agencies involved in *making* a photograph are flattened into a single agent that is contained in the image. The realistic quality of photographs, a faith in technology, and the inherent visual bias in our culture combine to influence against our awareness of the transformation of the object inherent in the photographic process. Thus, the extent of this thinking – in which a direct correlation between the photographic image and the world – can be found in Horton's *The Associated Press: Photojournalism Stylebook* (1990 n.p), where George Wedding, Director of Photography at the Sacramento Bee, characterises photojournalism as "holding a mirror up to society, so society can look at itself." This book was held up as the news photographer's bible. The actual and potential cost of this constricted perception is beyond measure. It provides the constant opportunity for - and perhaps the inevitability of - mistaking *a* view of the world for *the* view of the world. As Davey (1992 p.5) states "These views are especially problematic in those fields where the claim to objectivity holds preeminent value and is maintained through strong institutional support. Such fields constitute a wide and disparate group including photojournalism, social documentary and news photography; advertising; governmental and other institutional uses of photographs.

The decisive moment has been understood as a unifying moment that embodies the fullness of a given event. In documentary photography practices, in which there seems to be this hiatus or distilled moment usually depicting someone or thing in the midst of a

poignant activity, the affective nature of this moment dominates our attention to the image and has the ability to conceal the processes of the photograph's own making. Photographic theory and critique typically focus the discussion on the affective power of the image and hails that power as a measure of the photographer's aptitude and skill. Not only does this detract from the social (and political) intention of the documentary photograph but, since this genre places itself at the heart of realism it affects most uses of photography with the exception of those practices that are focused on critical engagement with the medium.

This is not just a problem for documentary photography, mastery and skill have been the primary standards of artistic judgement until photography's acceptance as art in the 1970's. The entanglement of automatism and agency has a long history in photography, given the medium's mechanical nature, and has been the source of both anxiety and creative energy over the nearly two centuries since the emergence of the medium. As one critic wrote in 1889, to render sentiment via photography "is analogous to the turning out of poetry by machine" (Stillman 1889 p.217). It is this nineteenth-century uneasiness over what remains of human agency when mechanical reproduction has removed the specific intentionality and deliberate design that art traditionally required that had implications for early struggles to accept photography as art. Later however, the acceptance of contingency as part of photographic practice shifts along with the historically changing meaning of chance in the mid twentieth century as artists began to grasp random effects not so much as an obstacle but as a source of creative expansion (Laxton, 2016). [19]

[19] In 1952, the same year that Cartier-Bresson's *The Decisive Moment* first appeared, Jung's essay, '*Synchronicity: An Acausal Connecting Principle'* was published. In it, Jung argued "The problem of synchronicity has puzzled me for a long time, ever since the middle twenties, when I was investigating the phenomenon of the collective unconscious and kept on coming across connections which I simply could not explain as chance groupings or 'runs.' What I found were 'coincidences' which were connected so meaningfully that their 'chance' concurrence would be incredible." (cited in Kelsey, 2009 p.73). Jung's account of synchronicity was a great benefit to photographers, for it underwrote the possibility of a transcendentally significant yet instantaneous correspondence between individual and world. A few years after Cartier-Bresson's *The Decisive Moment* appeared, a cognitive psychologist coined the term *apophenia* to describe the strong propensity of human subjects to find meaningful order in random data. (Conrad, 1958).

Fig. 3 *Grand Prix of the Automobile Club of France, Course at Dieppe 1912* by Jacques Henri Lartigue Gelatin silver print, 10 x 13 1/2" (25.4 x 34.3 cm). Permission to reproduce this image has been granted by Digital Image © The Museum of Modern Art/Licensed by SCALA / Art Resource, NY.

One such photographer who embraced the unexpected effects created by the correspondence between the world and movement and the camera was French photographer Jacques Henri Lartigue. His celebrated photograph of an automobile race in 1912 (Fig. 3) shows up the impossibility of a categorical distinction between mastery and chance or, a mastery of chance. The photograph depicts a Grand Prix car race in motion. Lartigue made it with a distinctive apparatus; his large camera was fitted with a focal plane shutter[20] which distorts rapidly moving images as a moving slit shutter takes some time to travel across an image of the subject. The photo shows a race car leaning in one direction

[20] Slit-scan photography is another term for this mechanism. Focal plane shutters slide one metal curtain away to expose the film and then a second to block the light again. With short exposures the second curtain follows quickly upon the first, forming a slit that move across the aperture (Wildi, 1992). Whilst most shutters in use today move left to right, Lartigue's moved up from the bottom, thus the film was exposed progressively from bottom to top. Movements at right angles to the motion of the slit introduce tilting of the subject either in the direction of motion of the subject or in the opposite direction depending on the direction of motion of the shutter slit with respect to that of the subject's image.

while spectators and telephone poles in the photograph are leaning in the opposite direction. This indicates that the camera was panned from left to right, probably to keep it aligned with the moving car, causing the figures to tilt to the left while the panning speed was not fast enough to keep up with the vehicle so causing the race car to lean in the opposite direction. Close examination of the degree of tilt in the image seems to also indicate that either the car changed velocity, the camera was not panned at a constant velocity and/or that the shutter curtain velocity across the film gate was not quite constant. Three speeds determined the appearance of the picture; the speed of the camera, the speed of the bystanders, and the speed of the car. Although Lartigue perhaps knowingly selected this camera for its ability to distort subjects in motion, he had just one exposure to capture the speeding car and could not have predetermined the exact effects from the dynamic intersection of relative speeds. Certain kinds of human action and intention cannot determine causal effects or fully explain observed phenomena. As much as a skilled photographer will have tried to have understood what the causes are for the effects they observe in the photographic image, it is the speed and complex mix of other non-human agencies in the world which supersede the limits of human intentionality. There are no photographs, no matter how choreographed or automated, that are immune to this.

Robin Kelsey (cited in Laxton, 2016) describes the aspects of photography that made it difficult for critics to judge its artistic merit: its unstable or 'hit or miss' chemistry that nevertheless produced meaningful effects; 'indifference', or the way the camera randomly records whatever is in the frame, giving equal attention to the trivial and the essential; 'contingency', the stubborn dependence on a capricious referent; 'serendipity', or the likelihood that even the least skilled operator could happen on an excellent composition. While these are all crucial elements running through all photographic practice, including the work that forms the photographic canon, scholarly recognition of these characteristics has largely been suppressed. Kelsey's alternative history of the medium links the specific

ways that chance enters photographic practice to its shifting role in science, industry, economics and mathematics. The chance aspects of photography served as evidence for a critique of mastery that would eventually gain artistic status for the medium (Laxton, 2016). This happened not by forcing the art establishment to overlook photography's unpredictability, but by expanding the overall idea of art to include chance as a creative strategy (ibid). Emblematic of this shift is John Baldessari's *Throwing Three Balls in the Air to Get a Straight Line (Best of Thirty-Six Attempts),* 1973, (Fig. 4) which depicts the results of throwing or bouncing three orange balls against a blue sky with the aim of producing a geometric configuration.

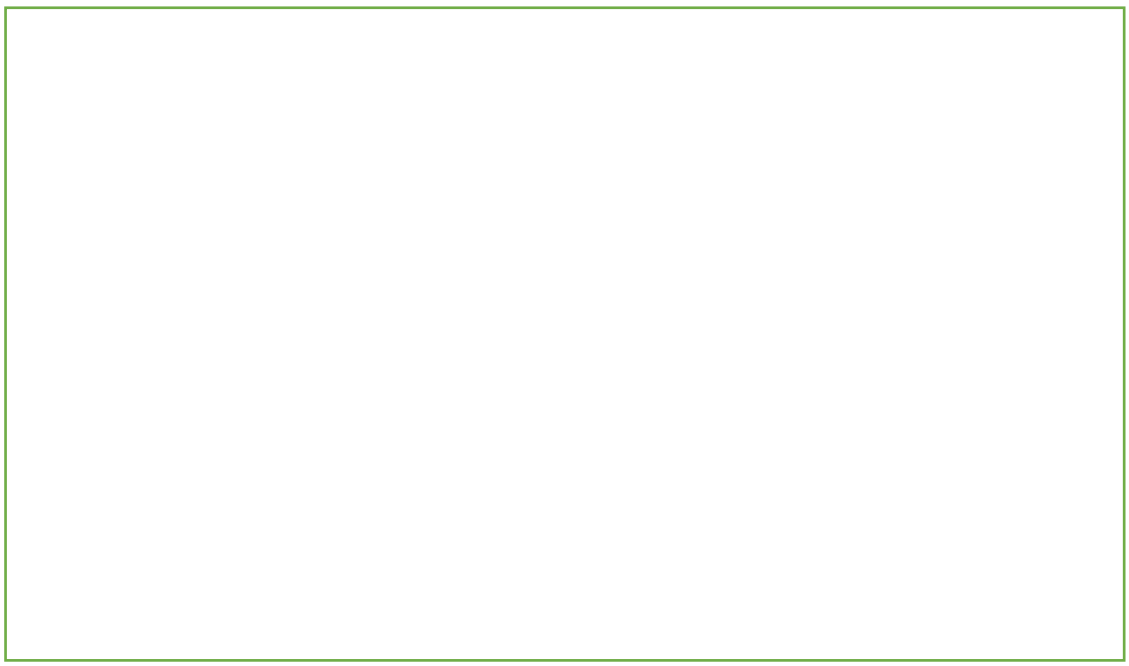


Fig. 4 John Baldessari, *Throwing Three Balls in the Air to Get a Straight Line (Best of Thirty-Six Attempts),* 1973. Set of twelve offset lithographs. This image has been removed due to Copyright restrictions.

Baldessari, who did not identify himself as a photographer, sought ways to test the limits of photography and artistic tradition by bringing together conceptual art, photography and probability to break the medium out of its insular aesthetic niche. It is important to note that the implications of relinquishing agency to the dynamics of chance may be different for different genres of photography, in particular we might contrast the implication of this

for documentary photography versus art practices.[21] Even in the context of art photography, regardless of the eventual displacement of mastery and skill as the primary standards of artistic judgement, it should not be denied that there is artistic intention, however slight or programmatic or compromised. The minimal photographic act, such as framing, is decisive, whether it is practiced literally (as in choosing to aim the camera at one thing over another) or metaphorically (as in allowing oneself to project meaning onto an 'accidental' or 'found' form). As Kelsey (2015) reminds us, this is important to the potential breach of ethics implied by relinquishing control of the image, that which is understood as abdicating judgement and therefore power: what is accidental, escapes culpability and threatens to render the medium apolitical, even amoral. This produces a tension between the autonomy of the apparatus and the traditions of connoisseurship of focussing on the author and the slipperiness of the documentary image. As Kelsey points out "over time, Cartier-Bresson's account of the decisive moment became a powerful alibi, and the photography market clung to it like a drug" (p.204). From then on, the market seemed to accept the documentary photograph as "an interface between the photographer's uncanny aesthetic intuition and the world's momentary revelation, so it could claim both inspired authorship and documentary power" (ibid). This approval meant the modern documentary photographer could now be exalted as "a master of chance" (ibid). In this way photographic discourse could maintain the auteurship and mastery of the photographer whilst avoid undermining the authority of the image.

[21] Although using chance as a creative strategy in documentary and fine art photography is now accepted and has few ethical implications, in journalism medicine, law enforcement, tourism and space exploration, the consequences may be quite different. Chance is still largely written out of photographic discourse because it undermines the authority of the photographer and validity of the image. However, a counter example from photojournalism, a photograph that embodies the pictorial evocations of a decisive moment but is unmoored by any claims by its maker to have instinctively mastered the visual field is Joe Rosenthal's 1945 photograph of U.S. troops raising a flag in Iwo Jima during World War II. The photograph earned him the Pulitzer Prize, but he also faced suggestions that he staged the patriotic scene since it was so academically composed. In fact, Rosenthal took eighteen exposures, one of which unconsciously caught a classic composition and became the most famous and reproduced photo from the war. Rosenthal confessed that its making was largely accidental, since he narrowly missed the event happening behind him. He claimed no special instincts, accelerated capabilities or mastery over the contingencies of the instant. His account abjured any mythical bond between photographer and world that promised to saturate the image with authoritative meaning.

To frame the photographer as 'a master of chance' returns us once again to human-centered narratives where the causal hierarchy of events tend to trivialise the complexities of the processes engaged in decision-making and action. It could be argued that the approach in documentary and photojournalism is to borrow the power from the world – in these practices the photographer and the camera are subservient to the powerful significance of events unfolding. The manifestation of this power can be understood in the resulting image where the affective nature of the moment dominates our attention, allowing the singular image to conceal the processes of the photograph's own making.[22]

Flusser states "Chance occurrences are part of the fabric or program of the universe" (2011, p.18). In practice, the centrality of chance in all practices of photography is also intimately interconnected to human action and decision making (agency and intentionality). Although Cartier-Bresson's original text indulges in some self-mythologisation and the centrality of the photographer, there is also humility in the way he recognises the collaborative nature of working *with* and *in* the world by declaring "we work in unison with movement as though it were a presentiment of the way in which life itself unfolds" (p.8). The complexity of the world made up of matter and its interactions, its energy flows, its associated infinities, and consciousness and its potentials, mean that the likelihood of improbable situations increases with time. If photographic theory is to understand the decisive moment in new technological image making practices, where the human is absent but interrelated with the technology, it needs to recognise that a photographer and the creation of artefacts always work or take place in an active and responsive environment. This draws attention to the importance of thinking about creative activity as contingent to a world that wants to do its own thing. In this respect, the photographer is less a master of chance and more submissive to chance.

[22] This problem is discussed in more detail in chapter three's analysis of the Zapruder footage featuring John F. Kennedy's assassination.

2.6 Conclusion

This chapter has reframed Cartier-Bresson's decisive moment as a moment which is distributed across social, political, technical and material dimensions as a way to emphasise the attenuated process involved in photography's decision-making and action. This reframing has revealed there is no one determining agent in the creation of photographs, the decisive moment is in fact distributed, it is everywhere at once, and certainly not reducible to one causal agent – typically understood as the photographer. Rethinking the decisive moment in this way produces a tension between the autonomy of the apparatus and the traditions of connoisseurship of focusing on the author. Evidence of this tension was made apparent through close examination of Cartier-Bresson's resourceful use of the camera as a humanist instrument through its modification and his measured, unobtrusive approach. This chapter has shown that while the legacy of Henri Cartier-Bresson and the decisive moment persist, key technological and environmental determinants that constitute this moment still largely remain overlooked by photographic theory. Such omissions suggest that histories of photography continue to value individual makers and iconic photographs over the collaborative processes that have been central to photography's development as a technology and as a social and material practice. To redress this problem, this chapter has shown how Cartier-Bresson's particular approach to his work offers a way to thinking about the relationship between the photographer, the apparatus and the world in an integrated way.

This integrated model of photography is further developed by showing how certain artists relinquished agency to the camera which consequently gave way to the recognition of the environment as active agent. In the quest to make photographs art, there was a requirement to show creative intention of the photographer, informed by a Newtonian logic and a commonplace understanding of cause and effect. In fact, as it has been discussed in art, sometimes small causes have large effects and vice versa. It is shown that

artists such as Henri Lartigue, Baldessari and Cartier- Bresson understood this and would wilfully use difficult materials to elicit distinctive effects and utilise contingent responses to the world as a creative strategy. In response to this quest to make photography art, contingency is incorporated in the image but only in a way that the photographer is considered masterful of it. This chapter points out the centrality of chance to all practices of photography is also intimately interconnected to human agency and intentionality. All photographs are the manifestation of an ever-shifting balance of chance, mastery and skill and in relation to an active, responsive environment. This point is significant if we are to understand the decisive moment in new technological image making practices, where the human is absent but interrelated with the technology as a kind of cybernetic organism. Insights drawn from rudimentary analogue practices of photography provide a tangible way to begin to understand the distributed nature of artificial and human agency during the most minimal photographic act. In much larger automated and outsourced apparatus, it begins to raise questions about the ethical implications for the displacement of human mastery and skill and relinquishing control of the image to the techno-ecological system.

A second iteration of this argument, in chapter four, will use a specific example - a contact sheet by Magnum photographer Jonas Bendiksen. Bendiksen has continued the reportage style that Cartier-Bresson pioneered when he founded the Magnum Agency. It will pay particular attention to the larger self-organising system and the mix of agencies which the photographer is part of and responds to. Before this, chapter 3 offers a rationale and methodology for reading the photographers contact sheet for some of the traces of determinates, both behind and in front of the camera, that manifest to co-produce photographs. It will argue for ways in which the photographers contact sheet has a powerful ability to reorganise the anthropocentrism of art historical narratives, which typically exclude corporeality and materiality as drivers of human history. Through a close reading of different contact sheets in the second part of this thesis, we are able to continue

to rethink the 'decisive moment' and attend to some valuable material that has been excluded through giving priority to the singular image, the persistence of auteurship and the apparent 'optimum moment'.

Chapter Three: Reading a Relational Meshwork in the Contact Sheet

This thesis identifies contact sheets (or proof sheets) from both 35mm and medium format SLR film photography as artefacts that can help us to rethink the centrality of the single image in photographic history, theory and practice, emblematic of which is Cartier-Bresson's pervasive ideas around the decisive moment. The contact sheet has the powerful ability to interrupt the conventional logic of cause and effect in the photographic process, in a way that more fully reflects the collaborative nature of photography. This artefact is particularly helpful for the argument of this thesis because it is a record of three simultaneous and entangled perspectives – the event being photographed, the photographer's actions, and that of the camera apparatus. This thesis makes particular use of documentary and photojournalism contact sheets because the number of images, the quality and ubiquity of 35mm contact prints means that they are most often an unselfconscious record of the collaboration between the photographer, the world and their apparatus. Unique to each photographer's approach, the contact sheet is a record of the unfolding dynamics of this collaboration over time. A close reading of these artefacts offers a media archaeological trace of vision and attention but more crucially an understanding of the co-authorship of the photographer's creative process with the world.

This chapter lays out the rationale for positioning the contact sheet as an analytical object for encapsulating event, action and apparatus. It reveals their particular affordances for showing up the collaborative nature of photography. Key to this task it uses a diffractive analysis (Haraway, 2003; Barad 2007) to outline the way in which the photographers contact sheet can be used to read a relational meshwork (Ingold, 2010) - that is the perceptual, technological, material, environmental and existential (affective) persuasive factors that bear upon the 'decisive moment'. It does this by first giving a detailed description of the process of making a contact sheet as a way to problematise its

relationship to indexicality, the consequences of which were discussed earlier in chapter one. While the contact sheet has been considered an indexical print, it has largely been embedded in discussions about authenticity and being 'proof', especially when the veracity of a single image is called into question, and thus the contact sheet has been recovered to offer detailed evidence. This thesis considers contact sheets less as evidence, but rather as tools of reassurance (Edwards, 2014). Together with other multimodal information, the contact sheet can be valuable for deciphering the inscription of some of the processes of creative collaboration between the photographer, world and apparatus. This chapter introduces the writing of Karen Barad, whose considerations of quantum mechanics and her resulting diffractive methodology, offers an alternative to representationalism by exposing complex, multiple, different and overlapping (marginal) identity positions. Images in themselves can be ambiguous, and "maintain a 'partial perspective' that is faithful to the particular position from which insights are generated" (Haraway, 1988 p.575), so it is necessary to delve deeper into the *dispositif* (Foucault 1977; Agamben 2009) or the 'black box' to discern the social and technological infrastructure that supports them. Using some principles of diffractive methodology, this thesis devises a series of techniques aimed at disrupting and dispersing a photograph's representational apparatus so that an alternative to complexities may be revealed. Following John Berger's (1972), assertion that "every image embodies a way of seeing" (p.10) this thesis considers photographs as a 'mode of seeing'. In this way the photograph is not a representation of the world but is part of the world. One such technique outlined here is to read the entire contact sheet as an integrated meshwork of relations instead of reading each of the images discretely or as a chronology. Through a material engagement with photographic processes this methodology aims to resist the contact sheet's representationalist apparatus. This provides a thicker explanation of the photographic process which can also assist in understanding some of the slippery evidentiary value of single photographs.

3.1 A commonplace understanding of the contact sheet

Contact sheets or proof sheets are, as the name suggests, photographic prints of a negative caused by the intimate contact between the negative and the light-sensitive photographic paper to produce a positive image of an entire film negative. To make a black and white contact sheet the process begins in a traditional darkroom with a red or orange light source which prevents fogging the light sensitive printing paper but allows you to see what you're doing in a room that would otherwise be totally dark. The negatives are pulled from the film canister (either a 35mm or 120mm 220mm or large format) and cut into strips that fit the printing paper (typically 8x10 inch but this can vary). The negative strips and the printing paper, pre-coated with a light sensitive emulsion, are slotted into a glass contact printing frame which is then clamped tightly against the paper. Alternatively, the negative strips could be laid on a piece of printing paper and held flat with a sheet of heavy glass. The whole frame is then exposed to light, generally for an exposure of about 8-15 seconds at f/8 for negatives of average density. The exposed contact sheet is then processed like any other print in three trays containing developer, stop bath and fixer, and then rinsed and dried. The contact sheet is typically then stored with the negatives and is helpful in locating individual photos in the future. The defining characteristic of a contact print is that the resulting print is the same size as the original negative, rather than having been projected through an enlarger. The experience of viewing contact sheets is invariably an intimate, even physical one. The small size of each image frame demands physical proximity hence they are often scrutinized with a loupe, a specialised magnifying glass held between the eye and the contact print, bringing the detail into a resolution high enough to be read by the eye. The photographer uses a grease pencil or Chinagraph marker to make notations directly on to the contact sheet to indicate personal selections for cropping, enlargement and print. They might also add the date and location they were taken, or other significant information.

This detailed description of the method of making a contact sheet highlights the human intervention and complexity in the process, thereby refuting the orthodox understanding of the contact sheet as a reliable index of the photographic process which elides any opportunity for creative decisions. This opens up a discussion of agency and causality which has been industrially masked by photographic discourse that suggests it is an unmediated, unadorned artefact.

Although contact sheets are a mundane intermediary tool in photographic circles they are not without creative opportunity. Despite the opportunities for modification and intervention their 'indexical' standing has meant that the technique has been widely used for a century by photographers to produce a record (and often a location guide) of an entire roll of film. In amateur photography, contact sheets were often used as contractual evidence between the processor and the consumer.[23] In professional photography the same contractual standing is used for a variety of purposes such as cataloguing and recovery, editing, selecting, but most particularly to authenticate the images through sequential correlation. With the rise of the illustrated press and the professionalism of photojournalism in the 1930s, an organised system for editing and storing images became necessary. This also paralleled the introduction of small-scale cameras (since 35mm became the standard for photojournalistic practice), which demanded the development of a system for editing. The Magnum agency of photojournalists, in particular, used contact sheets as an inextricable part of the process of photographing: as a record of ones shooting, a tool for editing and as an index to an archive of negatives. At the height of the magazine era in the mid-twentieth century, these sheets were used ubiquitously as a communal point of contact between the photographer, editor, agency and magazine and often bear the traces of the invisible steps of production, such as crop marks and instructions for the printer. The

[23] Until 2001 commercial processing labs such as Truprint used to supply contact sheets as evidence that the entire roll of film had been processed.

complex behind-the-scenes operation of shipping, editing and distributing film in the analogue era, dependent upon a network of couriers, editors and other third parties, is also important to bear in mind. In the very early years of photojournalism, if the photographer was away in the field and unable to edit their own work for immediate distribution to magazines, contact sheets were often edited by a fellow photographer or photo editor (Lubben, 2011 p.11). The photographer would be required to call in and debrief the editor, walking through the roll of film to alert him or her to important events or people in the pictures (Meiselas in Lubben, 2011).[24] Subsequently, for the best part of a century, the contact sheet has been an uncritically examined tool in the professional practice of documentary photography and also as an adjunct to commercial processing.

3.2 Evidential status of the contact sheet

As an intermediary tool, the contact sheet is largely embedded in discussions about authenticity. While this is true for some photographic practices such as photojournalism, documentary photography and reportage, the evidential potential of the contact sheet extends to other kinds of photography including portraiture. Kristen Lubben describes in the introductory remarks to *Magnum Contact Sheets* how placing a photographic image back into its context within a contact sheet invokes an instinctive sense of authenticity or proof.

> […] the traditional contact sheet, in its unaltered form is inseparable from the notion of proof: indeed, they are also known as 'proof sheets'. Placing a photograph back within the flow of time from which it was removed, the contact sheet holds out the promise of substantiation that an image is truly what it claims to be, that an event unfolded in the way the photographer claimed (Lubben, 2011, p.13).

Lubben is suggesting that what the singular image claims to be is rather different from how

[24] Although, according to Susan Meiselas, the move to digital has cut out some of the shared experience of the whole process. "Digital photography can permit greater sharing in the field but cuts out collectivity at the other end. Looking at the contacts was a collective experience, working with other photographers, editors and agencies" (Lubben, 2011).

it appears in the flow of time. It is of course questionable that this 'substantiation' is provided by the context of other images within the contact sheet. Perhaps it could be said that it provides a 'reassurance' (Edwards, 2014) [25] rather than 'proof' of an images' authenticity.[26] Lubben discusses the contact sheet in the context of photojournalism where there is a strong relationship between the single image and the contact in terms of authenticating events. When the single image is placed back within the flow of lived time of the entire contact sheet from which it was removed — as part of a chronological sequence of images, the photographers inscriptions and margin text showing film stock type — these metadata provide empirical access through formal elements and enable an extended reading of the individual image.

In the context of jurisprudence, contact sheets accompanied with the photographer's detailed notations, have often been called upon to contribute visual evidence in political and legal inquiries regarding individual negatives. There have been many examples in history where a single image's veracity is called into question and thus the contact sheet has been recovered to offer detailed evidence to corroborate or contradict received versions of events. When contact sheets are laid out for examination in this context aesthetic considerations of colour, geometry and composition are disregarded. Using a constructivist approach, evidence is discerned through the appearance of actions in the image, together with the photographer's accounts, inscriptions and the margin text on the negatives. Gilles Peress' contact sheets from Bloody Sunday – the 1972 shooting of unarmed protestors in Derry – were used to establish which soldier killed which demonstrator. Another oft-cited

[25] Anthropologist Elizabeth Edwards (2014) argues "that in many cases photographs were not "evidence" in any dynamic sense in information provision, but rather functioned as tools of reassurance"

[26] The clear distinction between truth, authentication and evidence is worth acknowledging here to avoid problematic arguments of truth claims in photography. Tom Gunning (2004) states that the truth claim in photography relies on the belief in both the indexicality and visual accuracy of photographs - both of which this thesis refutes. Since the contact sheet has been considered an indexical print it has fallen into this uncritical territory of being 'proof'.

example of the relationship between an image's authenticity and its contact sheet (or in this case, the lack of), is Capa's *Falling Soldier*, the iconic 1936 image which depicts a Spanish Loyalist militiaman at the moment of his death by enemy gunfire.[27] The single photograph may be our defining image of an historical moment, but the contact sheet or sequence of film frames show the uncertainty and even unreliability of that photograph by offering insight into the timeline that shows what was happening in the world before and after the image in question. Rather in the same way, the Zapruder footage (1963), a silent 8mm colour film sequence of J. F. Kennedy's assassination, taken as a home movie by a bystander Abraham Zapruder, was examined for evidence of the direction of gunshots. The Zapruder footage in most people's memory appears as a series of stills or stop frames because it has been so digested. It captured 26.6 seconds of the traveling motorcade carrying President Kennedy on 486 frames of Kodak Kodachrome film. Zapruder's film captured the fatal head shot that struck President Kennedy as his limousine passed almost directly in front of him. The low-quality film is the only confirmed recorded footage of the assassination and so investigators only had this imagery to establish a timeline. This example of material evidence is interesting because it is not only a trace of what is happening in the world, it also documents what is happening for the photographer. The shaky, badly framed image perhaps points to the fact that Zapruder was precariously stood filming on a concrete abutment, supported by his secretary (Øyvind, 2012). However, the jerky sequence of blurred frames after the fatal gunshot suggest Zapruder has been physically startled and jumps. The film is simultaneously a record of both perspectives – what is happening in the world and what is happening for the photographer who is a seamless part of the world.

[27] The iconic image has been called into question because of the recent discovery and publication of variant images where the mountain ranges seen in the background have led to a re-evaluation of the photograph's location. Fuelling the ongoing questioning no original negatives exists for the image, and there is no contact sheet left as its trace (Murphy, 2010 p.np)

3.3 Alternative affordances of the contact sheet

What the contact sheet can also reveal in these circumstances is how a photographer may utilise opportunist responses to the pro-filmic world as a creative strategy (as in conceptual photography such as Baldessari's *Throwing Three Balls in the Air to Get a Straight Line,* 1973) or wilfully incorporate contingency into the image to document the world, as is. Often photographers anecdotally describe how their creative intention was overridden when important elements or small surprises surfaced in the contact sheet; things that the photographer did not consciously comprehend when he/she depressed the shutter. It is precisely in the contact sheet that the Newtonian logic and a common place understanding of cause and effect is upended and where it can be seen that small causes can have large affects, and vice versa. Evidence in the contact sheet interrupts the logic of cause and effect and provides a thicker explanation of the photographic process. This oversimplified understanding of the causal relationship in photographic practice will be challenged in the following chapter.

The contact sheet not only records the action of the camera (and the processes of printing) but, bringing to bear insights from creative practice and literature from cognitive science, it can also provide evidence of some of the intentions and decision-making processes of the photographer 'in the field'. It offers valuable insight into the correlation between what the photographer is looking at and where he/she is directing the camera. Although photography cannot replicate the way our eyes observe the world, in the contact sheet we are afforded something of the photographers' 'self-corrective thought process as he/she reconciles their experience of the world' (Beardsley, 1965). The contact sheet provides a record of this negotiation, the process of mediation between the photographer, their apparatus, and the world, it also can reveal a trace of the broader relational meshwork of contingent determinants that press upon the photographer in each given moment. If agency in the photographic process is distributed amongst all the actants in a meshwork, then it is

necessary to understand the photographer's process of cognition and decision making as also distributed in relation to these actants. This entanglement of cognition and environment is examined further in chapter five where a particular contact sheet from sports reportage photography is analysed to show how distributed cognition is central to photography right from its inception. This particular perspective provides a novel approach to investigating the complexity of the collaborative meshwork within which the usually internalised processes of the photographer can be recovered through the tangible traces within the contact sheet.

Throughout the history of photography, it seems the physicality of photography has to some extent been concealed to preserve its enigmatic image (and perhaps is another reason why the contact sheet has been largely disregarded). There are two consequences of this: firstly, it has removed the body of the photographer from the equation, secondly, it has overlooked the agency of other persuasive factors present during the photographic event. Photographic history has tended to overlook the body of the photographer in terms of gesture, movement, muscle memory, cognition and as if the presence of the photographer him/herself is inconsequential and does little to sway the outcome of the resulting image.[28] The act of photographing is a profoundly embodied experience and the contact sheet has the ability to reveal, frame by frame, the physical activity of photographing as a series of actions and reactions whilst the photographer works in and *with* a world that ebbs and flows. Additionally, photographic literature has a tendency to discount the agency of other affective determinates such as, the functions of the camera apparatus, environmental conditions, unintentional or happenstance incidences and so on. These determinates form extended nodes of interaction; a relational meshwork of perceptual, material, immaterial

[28] Apart from Vilém Flusser (2014. pg 79) who pays particular attention to "the gesture of photographing", acknowledging the tentative "movement of doubt" working away inside each encounter with a subject.

and existential determinates that manifest in the co-production of photographic artefacts. Subsequently, some of these determinates that form the meshwork are preserved and can be read in the multiple layers of evidential traces in the contact sheet: (i) the way the event has been depicted by the photographer, (ii) the way the event has been depicted by the camera, (iii) the momentary formation of the world. These are read together with meta data material information such as the negative numbering, film gauge and pencil annotations made directly onto the contact print. It is only through the contact sheet that a more rounded impression of photography as a physical and collaborative activity, developing through time as a series of actions and reactions *with* the world, becomes clear.

In particular, 35mm contact sheets from documentary photography and photojournalism can be regarded as some of the more multifaceted examples that show an unselfconscious record of the processes of image making, in an often-pressured situation. Standard 35mm was at the core of photojournalistic practice in the twentieth century, and their contact sheets typically present an event broken down into thirty-six graphically laid out discrete negatives. Reading these contact sheets, the sequence of frames afford a trace in time and a record of the photographer's attention and intentions that have been registered by the camera.[29] Documentary and photojournalist photographers tend to shoot rapidly, and this makes these contact sheets more useful to this thesis because they afford, among other things, a way of seeing how a photographer is thinking over time. They show the continuous thought process of the photographer in a rapid succession of images and also frequently evidence how a photographer works and thinks under extreme duress. Furthermore, the combination of slow accretion and seismic event in the pursuit of the 'decisive moment' is more typically a feature of this genre of photographic practice.

[29] While editing programmes that create a simulation of the contact sheet from digital images are widely used today, they are a fundamentally different entity – a translation of what the photographer has seen, rather than its trace.

Contact sheets are valuable because they provide the first sight of an entire shot roll of film that preserves the raw details that are present in the negative, such as exposure errors, inadvertent shots, shifts in attention as well as material evidence in the negative surface, numerical data and annotated markings. A quasi-forensic reading of the contact sheet might avoid a criticism of total conjecture as a result of these empirical inscriptions of data imprinted on the film negative since these are akin to the coin or ruler in a photograph as external referent to validate the size of object. Additionally, by reading the particular effects in the image it's possible to determine information such as film gauge and therefore camera type, the use of flash or tripod and film light sensitivity, all of which reveal the formal restraints of the materials and apparatus used. For instance, the presence of film grain indicates a high ISO film and warmer or colder colour balance points to a particular film chemistry in different brands of film e.g. Kodak or Fuji.[30]

The contact sheets used in the three case studies to follow in this thesis are exemplary examples within their fields ie. photojournalism, reportage and conceptual art. Regardless their differing film gauges, layout of the negatives on the photopaper or the way the prints have been mounted, the shooting sequence can still be determined from the edge markings on the negatives and all are positive prints of the total negatives taken from an entire roll of film. The particular contact sheets in this thesis have been carefully chosen because of their individual ability to usefully illuminate certain aspects of the creative process and particular features of the collaborative meshwork discussed in each chapter.

[30] A Shirley card was used to develop colour film between 1940's and 1990's. The accuracy of colour balance in colour photographs was based on the Caucasian skin tone of the woman depicted in the Shirley card. The RGB sensitive layers in the negative film and the mix of chemicals solutions to develop the film created a colour balance which largely left out various, yellow, red and brown tones designed to accommodate a whiter skinned consumer market. Although digital cameras have a much broader dynamic range this technological bias continues as the default towards lighter skin in technology still lingers –i.e. recent reports show face tracking webcams do not recognise black people (Roth, 1998).

3.4 Using diffractive analysis as a non-representational methodological approach.

The method of reading the contact sheet outlined above has many parallels with a methodological approach defined by Donna Haraway (1992, 1997) and Karen Barad (2003) called diffractive analysis. In her book Meeting the Universe Halfway, Barad (2007) contrasts two optical metaphors – reflection and diffraction - that describe the behaviour of waves (light, sound, or water) when they encounter a boundary. In the context of physics, reflection refers to waves bouncing off an obstacle. Thus, reflection as a metaphor for inquiry is characterised as a mirroring of reality involving extracting objective representations from the world. Diffraction, within the context of physics, involves the bending and spreading of waves when they encounter a barrier or an opening.[31] A common visual of diffraction is the image of waves in a lake coming from different directions that overlap and interfere with one another, producing unique patterns at the point of confluence. Boundaries between the waves are illuminated and reconfigured in their meeting. In photography, the same phenomenon based upon the diffraction principles in physics produces visual effects in the photographic image. When photographers talk about lens diffraction, they are referring to the fact that a photograph grows progressively less sharp at small aperture values – f/16, f/22. As you stop down a lens to small apertures, the finest detail in a photograph will begin to blur. In short, the reason that this occurs is that as the aperture gets smaller and smaller, light waves spread out and interfere with one another increasingly more. Materially this phenomenon produces an effect that causes small details of photographs to blur.

Central to the idea of diffraction as outlined by Barad and Haraway is the notion of difference. Donna Haraway (1997) first articulated the notion of diffraction as a critical

[31] The term diffraction comes from Latin verb *diffringere*, which means to break apart. It was coined by Francesco Grimaldi in 1660 who observed that light streaming through a pin hole did not behave according to the Cartesian theory of light, which suggested that small particles of light would travel in a straight line when they encountered an obstacle. Rather the light particles behaved as a fluid, bending and spreading outward in different directions (Hill, 2017).

method "where inference patterns can make a difference in how meanings are made and lived" (p.14). Diffraction, therefore as a metaphor for inquiry involves attending to difference, to patterns of interference, and the effects of difference-making practices. As a methodological approach, diffractive analysis explores how material objects and processes can be understood through the effects created by their difference, rather than observing what these differences are (Barad 2007, p.71). As Haraway notes "a diffraction pattern does not map where differences appear but rather maps where the effects of differences appear" (2003, p.70). In this way diffraction creates something ontologically new, breaking out of the cyclical, inductive realm of reflection (Hill, 2017).

Both Haraway and Barad (1997) have highlighted difficulties with the strategy of reflection as means of gaining knowledge, Barad therefore offers diffraction as a productive model for thinking about non-representational methodological approaches. For Barad, reflection (or reflexivity) holds objects of investigation at a distance. It aims to find accurate representations, free of distortion, across different fields of study, and is concerned with the interaction of separate entities. Yet as Haraway states: 'Reflexivity has been recommended as a critical practice, but my suspicion is that reflexivity, like reflection, only displaces the same elsewhere' (Haraway 1997, p.16).

Haraway follows in literary theorist Trinh Minh-ha's (1996Minh-ha's footsteps where diffraction is often employed figuratively to denote a more critical and difference-attentive mode of consciousness and thought. When discussing diffraction for the first time in The Promises of Monsters (2004/1992): Haraway here explicitly refers to Minh-ha's idea of 'inappropriate/d others' – a notion that expresses how subjects are in a "deconstructive relationality, in a diffracting rather than reflecting (ratio)nality" (ibid., p. 69). Literary theorist Trinh Minh-ha's (1996) diffractive conceptualisation of identity and difference focuses on a non-dualistic, non-separational model of identity and difference, in which

identity categories, identified groups, and even identified *single* entities, diffractively crisscross, interfere, and co-establish one another, and differences are respected and allowed to exist and flourish (Minha-ha, 1996). Haraway considers diffraction to be a more "critical consciousness" than reflexivity, as it gives us the opportunity to become more attuned to how differences are being created in the world, and what particular effects they have on subjects and their bodies (ibid., p. 273). Seeing and thinking diffractively therefore implies a self-accountable, critical, and responsible engagement with the world.

As in new (feminist) materialism, diffraction is situated within a relational ontology. In a relational ontology both the human and non-human body are not separate or distinct, but they are continually disassembling and assembling and coming back together again in different ways to produce different sorts of identities concepts phenomenon and subjectivities. In this way the boundaries between the human and the non-human are porous and fluid and are constantly reorganising. As Jane Bennett (2010) would say "to the extent to which the us and the it slip-slide into each other" (p.4). "One moral of the story is that we are also nonhuman and that things too are vital players in the world" In this way there is no subject object distinction. For this thesis this raises central questions regarding who and what is responsible for generating new insights within photographic practice which causes us to consider the active role that matter plays within the photographic process.

In summary, as Barad (2007) states, diffraction as a methodological tool disrupts representationalism, figuring each and every intra-action an ethico-onto-epistemological matter, a quantum entanglement undoing cause and effect, effacing identity and sameness, reworking subjectivity as relation and ethics as embodied knowledge such that there is "no exterior position [of] contemplation … only intra-acting from within and as part of the world in its becoming" (p. 396).

The second half of this thesis offers three case studies which use diffractive analysis, as outlined by Haraway and Barad, applied closely to the contact sheet as subject-object. It is possible to analyse the contact sheet this way since it has the capacity to reveal sequential actions, both in front of and behind the camera. This twofold perspective enables the artwork to be reunited with its methods of production since a diffractive reading emphasises the material base and focuses attention on the processual, rather than representational aspects of photographs. In this way we are able to rethink the emergence of photographic artefacts by attending to some aspects that are neglected by those institutions and discourses that have given priority to the singular image and its representational analyses.

In art historical and theoretical discourses, the problem with representational analysis is its detachment of an artwork from its methods of production. The ocular emphasis that is characteristic of film and photographic theory has a tendency to regard visual media as lacking a material base, seeing them rather as visual representations of absent objects or subjects. In the following case studies in this thesis a diffractive methodology is used as an alternative theoretical framework to work with, instead of against, differences across disciplines. Using some principles of diffractive methodology, this thesis devises a series of techniques aimed at disrupting and dispersing a photograph's representational apparatus so that an alternative to representationalism may be revealed. For example, a diffractive reading of photography, across both analogue and digital platforms, can free images and insights from sedimented interpretations (usually prompted by the canon) and implement de-sedimentation in such a way that photographs, and their insights remain mobile.

Diffraction as a critical practice of engagement aims to understand the world from within. Key to this is an understanding of the constitutive role of the apparatus in the

creation of knowledge including the performative role of the artist and viewer. The analysis used in this thesis places particular emphasis on material experience, which focusses attention to understanding how material objects and encounters are produced and reshaped through 'intra-action' (Barad, 2007). Barad argues that learning, knowing, measuring, theorising and observing are all material practices intra-acting within the material world (ibid, p.90). Photography is very often used as a visualisation tool in these practices. Yet all these practices have a performative dimension and are involved in the production of the world rather than offering a neutral and objective description of it. As Sayal-Bennet (2018) states, in this way, "diffractive analysis accounts for the entanglement of researcher and researched", or the photographer and the photographed rather than considering the researched object in isolation, from a distance.

Important to this form of analysis of the photographer's contact sheet are the insights which draw upon material thinking from the author's own practice. Material thinking is a form of thought enabled through a connection to materials; a tacit knowledge fostered by the embodied sensations that occurred through the authors experience of making (as well as processing, printing, presenting and curating) photographic work. This experience provides particular material and processual perspectives that enable a move away from representational analysis, which tend to sit outside of these making processes by studying only their outcomes. As visual theorists Barbara Bolt and Estelle Barrett (2012, p.5). state: "[Art history's] focus on artworks rather than practice has produced a gap in our understanding of the work of art as process". Theorisation of art practice in representational terms necessarily excludes both practice and practitioners, because in attempting to understand and interpret the art object, practice is itself effaced. Material thinking as a method therefore focuses on the processual, rather than representational aspects of photographs, to reunite the meaning of the artwork with the way in which it

was created. In this way such an analysis substitutes a representation for an action (Bolt, 2004).

Because of photography's dependence on technology and apparent automatism it has been less discussed for its relationship to the artist's hand. This is despite traditional darkroom processes being haptic and heavily dependent on the direct involvement of the artist's body – dodging and burning areas of the print being one example. Bolt (2006) suggests such a "handlability" as a method to move beyond the limitations of a purely representational understanding of art. Drawing on Heidegger, she outlines a materialist approach to the making of work, showing "through the handling of materials, methods, tools and ideas in practice, that art becomes experience" (2004, p.48). Bolt (2013, p.124) differentiates between an image that is simply an illustration or picture of the world and a materialist image that "invites us to go beyond the figure to the abstract frame-work that holds it all together, and us with it." According to Bolt, "imaging provides the expansive force that undoes representation" (ibid) and this kind of imaging can be achieved through re-thinking the process or apparatus of photography. Rather than limiting photography to a purely automatic mechanical process, Bolt (following Stanley Cavell) describes it as a "complex articulation between the mechanical, the material and the discursive" (2013 p.135). A diffractive framing of photographic practice as an active site of bodily and material engagement offers some relief to the black boxed automatic and technologically derived photograph.

Furthermore, because diffraction troubles dichotomies and resists the most sedimented and stabilised/stabilising binaries, this approach will usefully assist in demonstrating a continuity between analogue and digital photographic practices. As Barad explains (2010), "intra-actions enact agential cuts, which do not produce absolute separations, but rather cut together-apart (one move) (pp.240–268). Diffraction is not a set pattern, but rather an

iterative (re)configuring of patterns of differentiating-entangling. As such, there is no moving beyond, no leaving the 'old' behind. There is no absolute boundary between here-now and there-then. There is nothing that is new; there is nothing that is not new (Barad, 2012). As Lister et al. (2003) state many digital new media are reworked and expanded versions of 'old' analogue media (p.12) The terms analogue and digital presuppose an absolute break where in fact none exists. Instead of seeing analogue and digital as discrete practices this mode of analysis understands each photographic apparatus as a multiplicity of processes.

In the following chapters three case studies will discuss certain aspects of the creative process and particular dynamics of the collaborative meshwork through the contact sheets of a documentary, photojournalist and conceptual photographer. The diffractive analysis aims to draw out particular dynamics that contribute to the overall argument.

Chapter four makes a diffractive reading of a contact sheet by Magnum photojournalist Jonas Bendiksen to allow different ways of talking about cause and effect that more fully reflect the collaborative nature of photography. In particular it will pay close attention to the way in which material bodies participate in the creative process in order to push us to notice the nature of assemblages or groupings of human and other-than-human participants, where the boundaries of those groups are dynamic and can shift, dissolve and be remade as the photographer negotiates with his surroundings.

The second case study discusses the distribution of cognition using a particular contact sheet made by Kees Molkenboer a self-employed press photographer whose football photojournalistic work regularly appeared in newspapers in the Netherlands. A diffractive reading of this artefact offers a tangible way to understand the different affordances and resistances of human and technological cognitive capacities and their distribution in

different moments during a football match. It traces the wider cognitive states and processes that go beyond individual minds showing that both human and non-human agents form integrated systems for performing tasks.

The third contact sheet by John Hilliard belongs to a seminal conceptual work in fine art photography and has been chosen because it exemplifies an almost automated approach to photography although it uses a film camera. This chapter extends the discussion using Flusser (2000), who raises concerns about losing photographic freedom to pre-set modes and standardised operations of the camera apparatus. Yet a diffractive reading of his contact sheet reveals how Hilliard's intention is contradicted by the animism of other determinates, in this case, the vitality of electricity. Matter is not 'given' to the human (in the form of the domestication of electricity) but rather acts on its own terms in an emergent, contingent and dynamic practice of materialisation. The final work demonstrates how the hidden performative participants in photographic practice are edited out, in order to foreground the authority of the artist.

3.5 Photographs in sequence verses the scrutiny of the single image

Another way to move beyond the image as a representation of the world is to look at techniques of juxtaposition and continuity in the sequential image. The distinguishing characteristic of contact sheets from professional photography is that they offer a sequence of images. Sequentiality and serialism in the practice of photography have long been used as strategies in the critique of representation and to question what the singular image can or cannot say. Here, the effects of the differences between the images created by their mode of presentation draws some parallels with a diffractive methodology, outlined above. The sequential image disrupts the conventions of photographic seeing and brings about insights from their interference patterns through the effects of difference. The viewer works through representation to see that which is communicated through the images but not

necessarily represented within them. This method was the main guiding principle of Aby Warburg's *Mnemosyne Atlas*. Although he did not specifically use sequences, Warburg juxtaposed diverse images to study, not the form of the works themselves but, the energies and tensions that result between the images. Essentially Warburg is making a diffractive reading of images which echoes Elizabeth Grosz's (2005) "call for running with the transformation of texts" to keep the meaning of texts fluid and relevant in the context of their time (p.3). For Warburg this method was used as a way of studying the embodied 'pathos formula' of a period (the bodily-based energies, such as the psychologies, philosophies, beliefs and memories, of that period) found through the differences, contradictions and tensions expressed in the style of the depicted figures. This strategy is also echoed in Deleuze's 'philosophy of difference' where his concept of a series, as multiple and unstable formations of singularities, reveal that difference is an ordinary and primary force prior and resistant to representation (Kaji-O'Grady, 2001).

The widespread use and prevalence of practices of photographic seriality are an ongoing and well-established phenomenon e.g. the photo story and the photobook, yet 'the photograph' largely continues to be understood – theoretically, historically, commercially and curatorially - as a discrete, autonomous unit. The photograph, singular and isolated, has long enjoyed default status as the basic unit of analysis, even though in practice, a photograph is reliant upon other elements for its resonance and the intelligibility of its form as, say, accompanying text, one frame of a motion film, one frame of a comic strip, or one frame of a negative on a contact sheet. However, from the medium's earliest years, artists, scientists and anthropologists have been experimenting with photographs in sequence and creating their own visual methodologies methodologies.[32] This method of

[32] Also seen in the work of Francis Galton who in 1877 devised a technique called 'Composite Portraiture' in which photographs of different subjects were combined, through repeated limited exposure, to produce a single blended image. Galton hoped his technique would create an average face to aid medical diagnosis, and even criminology through the identification and visualisation of a different human 'types'. Also Eadweard Muybridge (1830-1904) and Étienne-Jules Marey (1830-1904) made 'seriates' (as they

presentation, became a useful strategy to deal with the limited truth of the discrete photograph.[33]

3.6 Reading contact sheets as a totality

Since the contact sheet has been a thoroughly neglected artefact it has not been subjected to scrutiny in the way the single image has – for subject matter, content, framing, lighting, composition, perspective, depth of field, focal point, context etc.[34] In this sense, it completely detaches itself from the discourse of the single shot, except in jurisprudence and in aesthetics. Traditionally, contact sheets are read as a linear series, a chronology, since each negative is numbered and laid out in sequence on the printing paper to be read from left to right. Photo editors would measure moments before and moments after and the juxtaposition of one frame against the next, striving to find the 'distilled' definitive single image that most fully represents a captured event. Yet there is another way to read modes of sequence as the avant-garde, Hungarian constructivist, Moholy-Nagy (1947, p.54) points out:

> The series is no longer a "picture", and none of the canons of pictorial aesthetics can be applied to it. Here the picture loses its identity as such and becomes a detail of assembly, as essential structural element of the whole which is the thing itself. In this concatenation of its separate but inseparable parts a photographic series inspired by a definite purpose can become at once the most potent weapon and the tenderest lyric.

Many avant-garde artists in the 1930's such as Minor White (1908-1976) and László

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were known in the 1880s); studies of human and animal locomotion to investigate movement in terms of its external traces. Their intention was to secure a continuous trace which could be studied to show the workings of ankles and knees, or prove that all four feet of a horse leave the ground during a gallop.

[33] The problem of reading singular images for evidence is tackled in the authors paper 'A Relational Ecology of Photographic Practices' (2017) in the thesis appendix.

[34] Partly a symptom of photography's reticence about exposing its working processes and the vexed question of authorship. Contacts sheets carry a kind of ambiguous anxiety, coveted as evidence of the photographer's more intimate narrative – they might harbour untold secrets, and those secrets could destroy the post hoc narrative altogether.

Moholy-Nagy (1895-1946), started to question how people viewed and understood photographs by experimenting with the dynamics of photographs in succession. Later, Nancy Newhall curator of photography at the Museum of Modern Art in New York, wrote how photographic sequences needed to be studied – not as individual images in relation to its adjacent images, but "one must read the images as an ensemble, in their cumulative assertion of a complex and interconnected idea, to sense the import of the artist's statement." (Newhall, 1946 cited in Bunnell, 1989). White describes his method of reading photographic assemblages - not as a representation of the world but as access to it. In a letter to Nancy and Beaumont Newhall on April 20, 1952 White writes:

> I want photographs side by side; they fill my vision better, there is an eye-muscle satisfaction in scanning one then the other…there is more of reality, more of how the world looks. Guess it probably hinges on my feeling that the camera leads me back into the world – that I do not wish to isolate out of it, but to return to it, to keep in touch with it.

Rather like White and Moholy-Nagy, instead of reading the images in the contact sheet discretely or as a chronology this thesis will looks at them as a totality – the composite of the whole, as a meshwork. When the individual images are considered as an integrated meshwork of relations, they give insight into the time space relation the photographer was working within a – pattern of movement and a map that simultaneously traces points of the photographer's attention in time. As the images on the contact sheet are traced there is a kind of cumulative effect happening cognitively for the viewer, keeping the idea of the totality, of one thing in relation to another. Reading the images as a whole together with the black intervals between them we get a sense of the event that is much greater than the sum of the images contained within the contact sheet. The contact sheet holds the capacity to bring forth an impression of an event that is not wholly reducible to the sum of the images held within it. The black interval strip that separates each frame shows up the

tensions, differences and discontinuity between each image and generates an affective space where the viewer becomes an active participant in reconstructing the event as it was unfolding. The absent space in between images is where the imagination fills the blackout, we reconstruct the continuous movements and decisions made by the photographer in relation to the changing position of the objects and subjects within the two images either side of the black frame. A non-linear narrative emerges in approaching the entire contact sheet as a single image. Each frame of incremental movements made by the photographer or the subjects depicted, gives the viewer coordinates or the building blocks to map the feel of the captured space and unfolding event. The contact sheet can simultaneously offer the reader something about the general and the particular of a depicted event. Just as Cartier-Bresson's photographs show how he looks for a significant, particular moment that stands out from the vernacular, the everyday, the general. Whilst the contact sheet offers a kind of matrix view which geographically maps the environment the photographer moves within, at the same time, the viewer is afforded the process of the artefact's own making. The photographer is working all the time with his or her own thinking, the technology and the world, to frame, then capture the best possible image in each instant – this is a collaborative process.

3.7 Conclusion

Although there is apparently a precise recipe in how a contact sheet is made which suppresses creative intention because the process is standardised, the consequence of this is that the contact sheet has mostly been regarded as an immutable object that has an apparent forensic value. However, this seemingly simple process of making has mitigated against us looking at this artefact in different ways. In particular, the way in which this artefact can be a reliable piece of evidence of the collaboration between camera,

photographer and world which, in turn, can reveal some of the underlying determinates and dynamics shaping the production of photograph and the photographer's practice. Whilst the dominant way of understanding photographic practice is with a simple understanding of causality, this linear model doesn't stand up to the evidence revealed in the contact sheet. There are different ways of talking about cause and effect that more fully reflect the collaborative nature of photography. However, in order to do this, it is first necessary to address ways of understanding collaboration and meshworks of interaction. The next chapter will look at this more fully by reading the collaborative meshworks of interaction during a particular photographic event through the contact sheet, revealing a more complex understanding of causality. This revised understanding of photography rejects the idea that unilateral causes lead to effects, and also disputes the idea that causes are external forces, as if the presence of the photographer does not sway the production of the event.

Chapter Four: Non-linear Model of Causality in the Emergence of Photographs

The dominant discourse tends to give the illusion of a simplified causal relationship between the image and world – photographer witnesses the event, frames it and presses the shutter. In fact, there is an alternative way of showing how photographs come into being on the basis of visual and material evidence in the contact sheet. Instead of understanding the photographic process as momentary this chapter opens a discussion to account for other human, object and material agencies, the exclusion of which runs counter to the social intentions of the documentary photographer.

The work of this chapter is to show how a non-linear meshwork model of causality offers challenges to many of the assumptions in the theory around photography. By revisiting certain causal-explanatory theories, such as Aristotle's hylomorphism model, it contests the idea that materials and technologies are neutral handmaidens in our creative endeavours. Embedded in theories that don't deal with particularity, is a view of the hierarchy of human influence that, as a consequence, has built a discontinuity between theory and practice. To reconcile this gap this chapter makes a diffractive material reading of Jonas Bendiksen's *Satellites* contact sheet, attending to the interference patterns from the relational nature of difference and the particularity of relationships in the circuit between the photographer and the world. This analysis aims to show that any inherent bias in the hierarchy of causality is unsustainable. Using this tool of non-linearity, achieved by looking at the particularity of instances through the contact sheet, is necessary in order to pave the way for a meshwork approach to understanding the emergence of photographs.

Following chapter one which addresses the anthropocentrism of the way in which photographic practice has been understood in art historical discourses and media theory, and chapter two which challenges the decisive moment's paradigm of individual and

inspired creation, this chapter will address the question of how we might understand the causal relationship in photographic practice. Having argued for a modified understanding of Cartier-Bresson's decisive moment, this chapter aims to lay out some of the agential and relational ecology of determinants influencing the photographer during the photographic event, fleshing out how the photographic process can be thought of as a collaboration rather than the work of a single 'decisive' author. It will do this by making a diffractive analysis of a specific contact sheet by Magnum photographer Jonas Bendiksen, who continued working in the same humanist reportage style that Cartier-Bresson pioneered when he co-founded the Magnum agency.[35] A diffractive analysis is used here for three reasons; it will pay close attention to the way in which material bodies participate in the creative process in order to push us to notice the nature of assemblages or groupings of human and other-than-human participants, where the boundaries of those groups are dynamic and can shift, dissolve and be remade as the photographer negotiates with his surroundings. Secondly, it allows us to rethink the subject or object categories thereby bringing human autership into question. Thirdly, the method provides insight into the solidarity between the mind of the photographer and his negotiation with the world, a circuit usually so well closed to the onlooker but made available to us in the contact sheet.

The following analysis of the contact sheet is supported by accounts from an interview between Bendiksen and Magnum Photos which discusses the sequence of 'improbable

[35] Magnum agency is a French cooperative of photographers founded in 1947 by Robert Capa, David Seymour, Georges Rodger and Henri Cartier-Bresson. They were responsible for producing reportages for renowned magazines such as the North American Life and a variety of newspapers. Magnum is one of the first photographic cooperatives, owned and administered entirely by members. In order to maintain their independent voice, Magnum insisted on three core policies: the photographer maintained the copyright over his own images, photographs were not to be cropped unless permitted by the photographer, and photographs could only be published with the caption written by Magnum. As a consequence, a classic Magnum style or brand is shown to have emerged from particular historical conditions and the personalities involved in the founding of the agency. Magnum style remains the definition of "good" photojournalism and thus has important implications for the way viewers perceive events that are mediated through photojournalism and documentary (Magnum Photos and Michael Ignatieff, 2000 p.51).

events' that led to the surreal moment he captured.[36] The interview is exemplary of the simplified descriptions of events and tendency toward a rather direct notion of causality in the way the photographic image is discussed, it is also a product of the commercial imperatives and humanist values. However, in the following, it is quoted at length, because as the discussion unfolds, Bendiksen acknowledges the role of contingency in the photographic event, and later hints at the complexity of the event happening outside the frame.

The interview, led by Magnum agency, reinforces a certain dominant approach to discussing documentary photography practice which is from a perspective of the photographer's intentionality and supported by anecdotal stories of chance encounters. Just as the chosen image is edited for the format of the book, the interview that describes it has also been edited to uphold the enigmatic decisive moment. The slipperiness of the reality claims of the documentary photo, are reflected in the interview, in which the straightforward notion of casualty is modified in the second part of discussion. Here Bendiksen acknowledges the extent to which he is responding to unpredictable factors that gives us a sense of his subservience to the contingencies of the event.

Bendiksen's approach to his work is consistent with Cartier-Bresson's vision of the Magnum agency, the project of which was to promote humanist values but resulted in an eliding of complexity and contingency in accounts of the photographic event. Clearly, most the work that derives from the Magnum Agency is designed to meet commercial imperatives yet the migration of this approach, where the commercial imperative is not the driver, can be seen in other photographic practices.

[36] Since writing about Bendiksen's contact sheet in a conference paper entitled *The Contact Sheet Close Up* presented at the Ways of Seeing Conference at Royal Museums Greenwich, London in 2014, it has been interesting to see that this artefact has also attracted significant interest from other curators and writers.

This chapter provides a thicker account of causality in the emergence of photographs by considering nature, technology and arts tools as active 'players' that can change the conversation of creative pedagogy because they contain the potential for new possibilities beyond the human. Ultimately a thicker account of causality may help us to grapple with emerging technological photographic practices and modalities, in a world in which photography is ubiquitous.

Fig. 5 Jonas Bendiksen *Satellites. Altai Territory, Russia*. 2000. Villagers collecting scrap from a crashed spacecraft, surrounded by thousands of white butterflies. Permission to reproduce image has been granted by Jonas Bendiksen. Copyright: ©Jonas Bendiksen / Magnum Photos

4.1 Bendiksen's *Satellites*

The object of reference here is a photograph by Jonas Bendiksen from 2000 showing a section of a fallen space rocket on a farm near Russia's main spaceport in Baikonur, Kazakhstan (fig. 5). Before we set about trying to understand the image on its own terms, it is helpful to consider the thicker context of what was going on during that photographic

event between; the photographer, the camera apparatus, the immediate environment, other humans and non-humans, politically and socially.

Magnum photographer Jonas Bendiksen spent seven years journeying through the former Soviet Union and documenting the lives of the people there. Bendiksen's 2006 book *Satellites* (fig. 6.) is the culmination of his years travelling across the southern borderlands exploring the unrecognized states, breakaway republics and remote communities that were born out of the collapse of the Soviet Union. Whilst travelling between Russia and Kazakhstan his project brought him to the Altai Territory close to the boarder of Kazakhstan, where he took this photograph of two villagers collecting scrap metal from the wreckage of a crashed spacecraft. This image would later become one of Bendiksen's most famous works and the cover of his book.

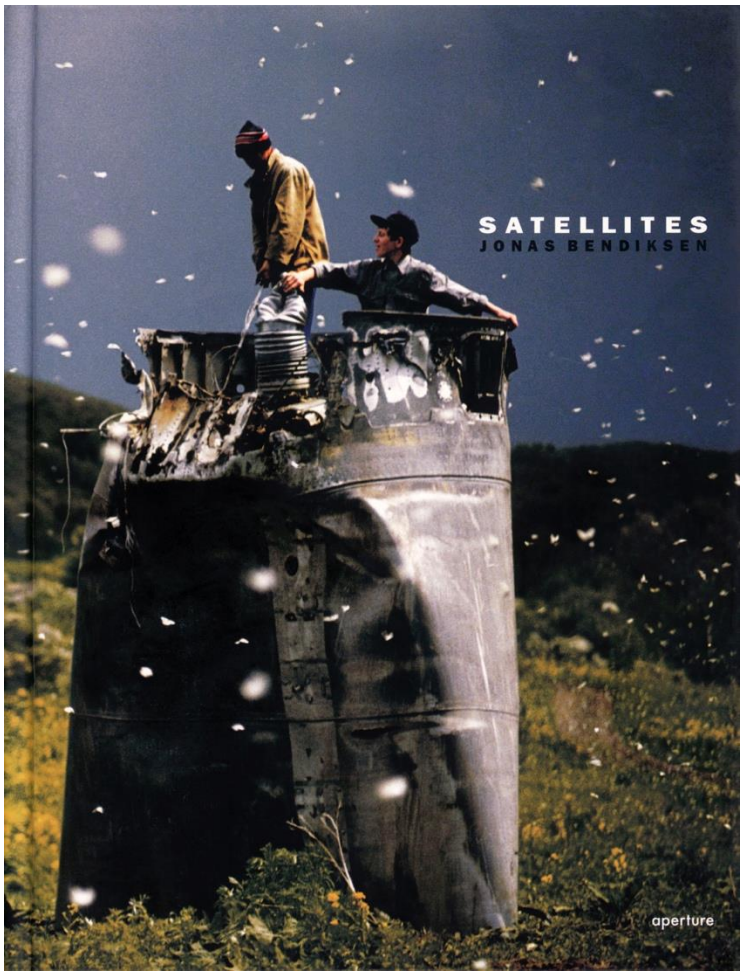

Fig. 6. Book Cover: *Satellites: Photographs from the Fringes of the Former Soviet Union* (2006). Aperture, New York. Permission to reproduce image has been granted by Jonas Bendiksen.

The Altai Territory is notorious for its spacecraft crash zones. Most of the shipments and cosmonauts taken to the International Space Station are launched out of Baikonur. The space rockets consist mainly of fuel tanks and booster engine stages that never reach orbit, falling back to earth when spent. They come crashing down into this area as often as three or four times a month. Local people say the rockets have bad health effects on their health and that the toxins are poisoning the soil. Despite the environmental impacts, for many of the people in this area the rockets are a source of income since they provide them with hard cash for scrap metal. Bendiksen claims the villagers have inside information about exactly where and when these rockets are going to come crashing down. They stand and wait in the exact location since they don't want anyone else to get there first (Bendiksen cited in Lubben, 2011). Bendiksen's intention was to document the lives of the people who make a living chasing after these rockets and selling the scrap metal.

In the following interview with Magnum Photos (n.d) Bendiksen gives an account of the day he was driving along looking for a relatively fresh wreck that had just crashed in the area (permission to reproduce this extract has been granted by Jonas Bendiksen):

> *What is happening in this photograph?*
>
> There are two young guys, local farmers I think, who are pulling copper wire from the hull of a crashed Soyuz spacecraft – specifically the second booster stage. I was chasing a story about people who live in the areas under the flightpath of space rocket launches from Baikonur, Russia's biggest spaceport. As we know, everything that goes up eventually comes down, and each time a space rocket launches from Baikonur the massive booster stages fall down to earth once their fuel is depleted. At least at that time they fell down into populated areas. While some locals complained about health problems and mysterious diseases allegedly

stemming from the rocket crashes, others made good money out of them selling the precious high-grade scrap metal. So, I was photographing these men who had started ripping up the spaceship. It had just rained heavily, and the storm clouds were passing in the background, giving that dark background. The sky filled with thousands of white butterflies. Farmers, space rocket, butterflies, sunlight on stormy skies: all in all, this is probably one of the most surreal and magical moments ever to pass before my eyes.

Where and how was this image made?

It was taken in the Altai territory of Russia, just north of the border with Kazakhstan in 2000. It was taken with a medium-sized telephoto lens, which is what makes the butterflies compress to fuzzy white out-of-focus dots. But on some of the more distant ones you can see the wings beating.

What was happening outside the frame?

I'm definitely happy about this picture, it would be wrong of me to complain about anything. But having said that, right outside the frame there was a third guy on a horse. […] I do remember right after this there was a great big picnic party. All the scrap metal collectors and locals gathered down at the river a stone's throw away from the scrap. Lots of food, salads, snacks and quite a bit of booze.

Tell us a secret about this image?

Hm…well, I can admit that the evidence suggests that I didn't really understand at the time that this would be a great picture. Maybe I just stumbled into it and it was pretty much down to luck, instead of buckets

> of talent and know-how. The contact sheet shows that I took three images in total from this angle, even though the situation went on for a while. I think I've got about half a roll of film of the entire scene. If I came across this today, I suppose I would have recognized it for what it was and pushed that shutter button quite a few more times. But on the other hand, back then in the film days, we were maybe better photographers who were better at trusting one's instincts at the right moments?

Ten years after he took the photographs Bendiksen is struck by how unaware he was of the significance of the event that led to the single iconic photograph (image 27 in the contact sheet fig.7) one he had used many times:

> I hadn't looked at the contact sheets in years, as I'd cut out my chosen frame and left the rest in an archival box I hardly ever accessed. Once I dug it out, I couldn't help laughing aloud. I was shocked, but thrilled, at what it showed – a complete unawareness of the magic that was swirling around me. [...] In any case here we were in a cloud of white butterflies circling the remains of a Soyuz space rocket's second stage, while local farm boys were gutting it for usable scrap metal. (Bendiksen cited in Lubben, 2011, p.430)

The contact sheet provides a critical distance to allow the photographer to re-edit and redefine the decisive moment after the event, when he or she can reengage with their own vision as if in third person from a reflective distance. One of the paradoxes of the exemplary street picture, of Cartier-Bresson's mantric 'decisive moment', is that it hardly ever represents the final resolution of all the high-pitched physical activity, but is more commonly a by-product of it, identified and selected later from frames of the same event that precede and follow it. Although there is no question that the 'decisive moment' exists only for the photographer, Bendiksen is clearly humbled by an awareness of working *with* and *within* a world which was doing its own thing and not at all performing for him.

Fig. 7 Contact Sheet Print: "Satellites," Altai Territory, Russia, 2000. Permission to reproduce image has been granted by Jonas Bendiksen. Copyright: ©Jonas Bendiksen / Magnum Photos.

4.2 A diffractive analysis of the contact sheet

When the 'decisive photograph' is placed back within the flow of lived time of the entire contact sheet from which it was removed, it becomes once again part of a sequence of images with black intervals in between each one, along with the photographers inscriptions and margin text showing film stock and type. Together these provide empirical access through formal elements and enable an extended reading of the image. In contrast to the

exemplary, single photograph, which is typically abstracted from the act of photographing in order to underscore its enigmatic quality, placing the decisive photograph back into its 'before' and 'after' sequence within the contact sheet reinstates a sense of the physical and causal process that brought the image into being. In doing this it places the viewer back in the world of active, unfolding visual experience, with all its concentrations, tensions and distractions, its capacity for revelation and distortion, and its wonder and contingency. To understand the ecology in which the photographer works, this diffractive analysis of the contact sheet aims to recover some of the interrelated causal determinates and interference patterns by reading the appearances of the effects and affects in the images.

If we read this contact sheet as a totality, we can ask non-relational questions such as: what is the orientation of the image? Or we can ask relational questions such as: what is the position of the horse in relation to the spacecraft? Furthermore, through reading the relationship *between* the objects depicted within the image we can decipher information about what was happening in the world outside of the depicted frame in those moments, such as the movements and point of view of the photographer or the position of the sun in relation to the size of the shadows. A further step back means we can determine some additional relational information about the camera apparatus, a trace of which is inscribed in the material artefact. This reading is provisional and developed by the author's own experience of photographic practice and in particular, of using 35mm film. It also brings to bear some of the 'out of frame' information given in Bendiksen's interview to be mindful of the contextual void that is almost inevitable in reductionist approaches to reading images, for example, in the theories which equate photography with vision by authors such as Arnheim (1974, p.159) and Emerson (1972, p.114).

To understand the causal relationship and the dynamics of the multiple agencies involved in *making* a photograph three key points will be addressed from a diffractive analysis of

Bendiksen's contact sheet: (i) The world is almost certainly non-linear, and not at the mercy of or working for anyone other than itself. (ii) The photographer's thought process and aims are non-linear, interrupted by other occurrences, indecision and contingencies and so continually modified. (iii) The camera apparatus is not a predictable, neutral, mechanical tool that is subservient to the desires of the photographer.

Jonas Bendiksen's contact sheet shows thirty-eight 35mm colour images, all but three featuring the same part of a fallen spacecraft on farmland at the same location. It is clear it is the same spacecraft from the way it has fallen, impacted and marked the ground, the features on the front end are the same way up in every image, whilst the background landscape slightly changes. The short shadows on the ground indicate the sun is directly overhead, so it is likely to be near midday. The first twenty-four images show the same spacecraft object from differing perspectives, which Bendiksen appears to animate through the captured movements around it, working toward an optimum alignment in order to grasp the equilibrium of the compositional dynamics. Cartier-Bresson illuminates this working process from firsthand experience:

> Sometimes a single event can be so rich in itself and its facets that it is necessary to move all around it in your search for the solution to the problem it poses – for the world is movement, and you cannot be stationary in your attitude towards something that is moving (Bresson, 1952, p. 3).

In *Matter and Memory* (2004) Bergson hints at interference patterns and diffraction as a tool to define attention as an adaptation of the body rather than the mind (p121). Bendiksen's body is the fine-tuned calibration tool that recognises the optimum compositional dynamics he searches for. The emergence of new phenomena and new compositional dynamics are felt through ongoing bodily adjustments in response to his relationality and difference to other active participants within the landscape. His attention does not involve a zooming in of his perceiving mind that comes to a standstill, thereby offering him the

perception of a fully delineated object outside itself, but a careful attending of the body, working out a "solidarity between the mind and its objects, …a circuit so well closed, that we cannot pass to higher states of concentration without creating, whole and entire, so many new circuits which envelope the first and have nothing in common between them but the perceived object" (ibid., p127). These circuits include diffractions that have a productive effect.

In the fifth image, top row, (negative numbers have been trimmed from the top edge of contact sheet) in the distance a grey horse appears to be ploughing a field and a blue tractor is travelling towards it. From image 17 to 23 it seems Bendiksen has fixed his viewpoint on a farmer walking across the frame. These images are slightly overexposed, indicating a sudden change in the brightness of the weather. These slightly bleached-out images make it harder to see detail, but on closer inspection of image 17 it is possible to see some fuzzy white out-of-focus dots that indicate the butterfly storm (something we only understand from subsequent images and reading the contact sheet as a whole) has just arrived. In the intensity of this moment it appears Bendiksen was looking for the classical triangular pictorial composition between the tree, the spacecraft object and the farmer walking into frame. Consciously or not, he was using Cartier-Bresson's well-established technique for composing the static components in the frame and waiting for the final moving element to walk into it. The image with the greatest clarity of triangular composition, image 18, has been selected and marked with a Chinagraph pencil by Bendiksen or his editor (which could perhaps be determined forensically but is not the issue here).

Between image 23 and 24 the discontinuity in the landscape shifts between the cultivated rural and a kind of wilderness. The relative positions of the different objects depicted show a decision by Bendiksen to take a different perspective on this subject. The shadows on the ground now appear on the left-hand side of objects indicating a 180-degree turn. Such a

significant visual displacement tells us that the image (and photographer) have jumped forward in time as well as space. This rupture very likely marks where one idea is brought to an end and another one begins.

The notion of an 'individual vision', of a search for 'balance and harmony' and the methods of achieving it, are part of rhetorical strategy used to discuss the fabled 'Decisive Moment'. Clair (2006, p.53 cited in Ward 2008, p.136), describes "an aspect of the photographer's skill as being able to make predictions in a millisecond what is about to happen next. He can do this because he remembers that he can predict." There is an element here, of the time being opportune yet pending, held in readiness, and thus the photographer, who is all action, is also poised before action. The instant being described here is one where the scene could fracture in any direction, the photographer is poised, holding this tension, already seeing the simultaneous multiple potentials and ready to dash in any direction. This element of the moment is of hiatus and anticipation and not of conclusion, that which is just before a decision is made.

In frame 24 Bendiksen has recognised this moment is already upon him, a dense cloud of white butterflies flood the scene, and are made all the more luminous against the sky by the particular atmospheric conditions. Bendiksen recounts "There had just been a storm squall, there were stormy dark clouds in the background and sunlight was just starting to break out. It was this perfect storm of different elements" (Magnum Photos, 2015). He receives this unfolding moment by shooting twelve frames in what appears to be close succession. The contact sheet shows that he shoots three frames (images 24, 25 and 26) from one angle, whilst adjusting his telephoto lens to deal with the rapidly changing dynamics. In this moment two young men are pulling copper wire from the hull of the crashed spacecraft, a man on horseback is walking away towards the blue tractor driving towards him, a soldier who has chosen to photograph the same scene positioned in front of him, all whilst

surrounded within a storm of white butterflies. This intra-action between farmers, space rocket, butterflies, sunlight on stormy skies create a significant affective experience for Bendiksen who recounts "this is probably one of the most surreal and magical moments ever to pass before my eyes". Bendiksen is 'moved' by the affective energy of the relations between human and nonhuman players. He is paying attention to the way in which material bodies participate in a potent configuration which pushes him to notice the voices of assemblages or groupings of human and other-than-human participants in dialogue, where the boundaries of those groups are dynamic and can shift, dissolve and be remade as learning proceeds. The experience of affect is fundamental to the act of photographing because its capacity to 'move' a person or subject provides the felt knowledge and decisive influence that prompts him/her to respond. The capacity of affect to move a person or subject means that he is part of a relational process, not stood outside of it as an impartial observer. Erin Manning (2010) argues that the body is always more than human, and that affect is always collective. As evident above, "affect is the capacity of the body to experience itself as more than itself, to be in excess of one's actual state" (Deluze 2013, p.37). Most affect theorists, despite their disagreements on the epistemological and ontological nature of the concept, agree that affects travel between (human and non-human) bodies, and are experienced a-subjectively. Affect can be understood as integral to a body's perceptual 'becoming', in which that body is always becoming other than what it is. As Chappell (2018) states, we can consider nature, technology, science and arts tools as active 'players' that can change the conversation of creative pedagogy because they contain the potential for new possibilities beyond the human. Furthermore, Braidotti (2013) proposes that as we are transposed "beyond the confines of bound identities art becomes necessarily inhuman in the sense of nonhuman in that it connects to the animal, vegetable, earthy, planetary forces that surround us" (p.107).

The trace of the image-making apparatus and Bendiksen's rapid adjustments to accommodate the both the phenomenon of diffraction and the environmental conditions demonstrates his insight into the relationship between affect and effect. This can be seen more clearly in images 24, 25, 26, 27. Bendiksen is using a medium-sized telephoto lens, with a small aperture (say, f/16 or f/22) to get a large depth of field (the region of the image which will be captured in sharp focus). However, this produces the effect of making the foreground butterflies compress to indistinct white out-of-focus dots whilst the more distant ones in the focused depth of field are identifiable by their beating wings. At long focal lengths, with a close subject like the butterflies, the depth of field can be as small as a few millimetres, meaning that tiny errors in focusing accuracy will result in the crucial part of the shot that needed to be in focus (the spacecraft), will be soft. Using a small aperture to get all the scene in focus will cause a reduction in sharpness from the effects of diffraction and there is no way for Bendiksen to circumvent the laws of physics to avoid this.[37]

In addition to this, one of the biggest hurdles Bendiksen would have needed to manage when shooting with a telephoto lens is camera shake – a softness introduced by not being able to hold the camera steady for the duration of the exposure – this can be overcome by shooting at a much higher speed. Perhaps so many moving subjects in frame were too difficult to manage, perhaps Bendiksen knows he has this perfect luminous light but for an unknown amount of time, and that the butterflies will soon disappear. He waits for the horse to move out of frame and shoots image 26 which again features the classic triangular composition. Bendiksen adjusts his camera view to the right and zooms in slightly to eliminate tractor, horse and soldier and frames the two static spacecraft objects together while focusing on the two young guys breaking down the spacecraft. These images, 26, 27

[37] Some camera manufacturers, including Pentax, have a diffraction-reduction menu option; however, this is nothing more than a standard unsharp mask cooked into the RAW file.

and 28, have also been selected and marked by Bendiksen or his editor. Images 30 to 35 show that Bendiksen seems intent on including the horse in the frame, yet the tractor in the distance, behind the horse, is obscuring the animal's outline and preventing a clean composition. This overlap of ideas will have had a diffractive affect on Bendiksen. As Bergson articulates in his essay *Intellectual Effort* "we are not dealing here with an idea, but with a *movement of ideas*, with a struggle or with an interference of ideas with one another" (p.179). After four exposures at this angle Bendiksen steps to the left to position the tractor out of frame and takes two more exposures, image 34 and 35. Bendiksen would have known this was his penultimate exposures left on the film. He shoots two last exposures but judging from the haphazard angle of the subjects and the inclusion of the rider, who is now dismounting his horse, there is a sense that the tipping point has been reached and the peak of the photographic event is apparently now over.

4.3 Negotiating with materials

Even with this last exposure shown on the contact strip, materially the event has not quite ended, since the presence of the unexposed portion of the film negative confirms the complete use of the roll of film, almost like watching the tail of a celluloid film projected on screen at the end of a movie. It also reveals that the film was loaded economically – in fact this roll of 35mm film holds thirty-eight and a half exposures, instead of the typical thirty-six. Film manufacturers will usually include about three extra frames worth of film in a roll to compensate for the fact that most cameras will load and wind differently. The tail of the film could be seen as a semiotic redundancy, but in this reading of the material, everything counts. If Bendiksen knows his equipment well, as the contact sheet suggests, he may know he doesn't need to waste film winding it on many frames at the start of the roll. The restrictive and unforgiving constraints implicit with the medium of film forces the photographer to work economically by editing as much as possible 'in camera' rather than deferring most of the editing to a postproduction process. In contrast to the infinite

vernacular production of digital culture, the automatic recording of everything and every moment in a constant stream of images bringing photography closer to cinematography, professional photographers worked with the limitations of film which enforced a particular way of seeing and responding. Bendiksen hints at this in his interview when he discloses "If I came across this today, I suppose I would have recognized it for what it was and pushed that shutter button quite a few more times. But on the other hand, back then in the film days, we were maybe better photographers who were better at trusting one's instincts at the right moments" (ibid).

This diffractive analysis of the contact sheet of sequential actions, both in front of and behind the camera, reunite the artwork with its methods of production. The contact sheet in its totality is presented as a series of decisive moments, and shows a synergy between the apparatus, the world, and the affective response to both as a series of practical decisions. This relational approach to thinking about the photographic image also needs to include a version of the world where the photographer is also an agent of reality construction.

In its complete and unaltered state, the contact sheet reveals how the photographer does not instigate a 'decisive moment' but is sensitised to and ready for it as they are engaged in a flow of lived experience. As Cartier Bresson (1952) declared "sometimes it happens that you stall, delay, wait for something to happen, you wait for something interesting to cross into the frame" (p.8). The photographer is alert and open to all the best possible potential images in each given moment and each image on the contact sheet firmly registers these moments. However, as the photographer and camera are part of this interrelated meshwork their presence starts to sway the behaviors of other determinates during the photographic event. This is most evident in frame 26, where a soldier has walked into the frame, crouches directly in front of Bendiksen and appears to be photographing exactly the same scene. As most photographers will recognise, when you point a camera at something,

it focuses the attention of others around you towards the same thing. Here we see explicitly where the presence of the photographer starts to change the actions of others and the very nature of the event. As Vilém Flusser (2014 p.82) acknowledges, photographing people is a "complex mesh of actions and reactions" a dialogue, in which, just as the subject always reacts in some way to the experience of being put under scrutiny, the process of observation changes the observed phenomenon but also observation changes the observer. As Flusser (1991 p.83) asserts:

> The photographer cannot help manipulating the situation. His very presence is a manipulation. And he cannot avoid being affected by the situation. He is changed simply by being there. The objectivity of an image (an idea) can only ever be the result of manipulation (observation) of one situation or another. Each idea is false to the extent that it manipulates what it takes into consideration, and in this sense, it is 'art', which is to say fiction.

The claim to realism that documentary photography assumes is then made problematic by this entanglement (that in documentary terms would be considered a manipulation) that occurs simply through the photographer's presence, since the photographer's search is tightly bound up with this entanglement. Barad (2007) is clear that entanglement is not simply intertwining, but implies a lack of independence with objects, processes and people emerging through their very entanglement. Arnheim (1974), questioned the expectation to find a certain documentary value in photographs, and toward this end asks certain 'documentary questions': "Is it authentic? Is it correct? and Is it true?" (p.157). He pointed out that certain ethical and stylistic consequences follow from the close connection between photography and "physical reality" or the "facts of the moment" (ibid). The picture taker is on slippery ethical ground since "the photographer is part of the situation he depicts" and his picture, like the photon in atomic physics "upsets the facts on which it reports" (ibid, pp.151-152). Both the camera and the photographer are active, present participants in the scenario (Butler 2010; Nichols 2010). As Flusser (2014) asserts "search

and manipulation are two aspects of one and the same gesture" (p.82). Bendiksen is clearly intending to use the photographic strategy of the 'detached, objective spectator'. His contact sheet confirms this since the only visible trace of Bendiksen can be seen in the throw away 'wind on' exposures - half an image depicting Bendiksen's foot (seen in image 00) and a full exposure depicting part of his shadow holding the camera to his head (seen in image 0). His own image remains otherwise invisible which may convince the uncritical viewer of the documentary photo of an objective reality that stands apart from the photographer. Contrary to this, Bendiksen's intra-action with the world as he moves through uneven terrain is inadvertently depicted in the photograph in the form of a foot, a shadow; an uneven horizon line and a blurred image. A diffractive reading might suggest his foot can be seen from another, and at the same time, entangled perspective as something else, as a differential becoming or becoming differently (Barad, 2007), as a footstep forward, or in the performative action of moving from here to there. Either way this material trace of Bendiksen, whether through his gestures or his physical presence in the image, not only reunite the artwork with its process of production but also account for the entanglement of photographer and the photographed rather than considering the researched object as a discrete entity. These 'throwaway' images are of course omitted from the final edit, thus excluding any trace of a past and no connection to the photographer instead, substituting it for a mirror reflection (an instantaneous present).

4.4 The act of *making not taking*

Flusser's observation of gestures of photographing (2014) reflects on the way the photographer is *in* the world and not *taking* a photograph as if they are apart from it. This approach to photography is also implicit in new materialist discourses which reconsiders the impression that the photographer creates a representation of the world that is separate and stands apart from the photographer. Since the enlightenment there has been a view that "posits humans as makers of the world and the world as a source for human

endeavours" (Barret and Bolt, 2012, p.3). This way of thinking is typified in the anthropocentric rhetoric we use. When we photograph it is commonplace to say that we 'take pictures', as if the photographer is a mere collector of objective scenes, as if the scene is there for the taking and not affected by the photographer's presence. Bendiksen also freely uses this phrase and does not indicate any level of interaction between him and the subjects in his photographs. The *act of taking* as a static definition of the photographic thought reflects a logic of simplification and linearity tied to its process of creation. This term is inherited from the industrial era and has a connection to a machinic notion, where the term can be found, for example, expressed in the linearity of instruction manuals for devices. According to this perspective of simplification, the photographic making process seems to be understood as a kind of clock, that operates in an ordered flow of rectilinear steps and predetermined stages to generate visibility (Soares and Fava, 2017). This perspective has its roots in a Cartesian world view, in which "it is postulated that all material bodies are machines that operate by mechanical principles" (Vieira and Santaella, 2008 p.48). In fact, the word 'photograph', Greek for 'light writing', implies a passivity on the part of the photographer, who in the early years of photography was called an operator, as if he or she merely tends a machine - the camera - that mechanically records the image written by light on photosensitive paper (Glotfelty, 2014 p.224). This passivity on the part of the photographer shows up the more essential agency of light. The understanding of photography as the *act of taking* leaves certain questions unexplored, particularly in relation to entities, both perceptible and imperceptible, that are pertinent to the process of its creation, and, above all, denies that photographs are caused by phenomena; thereby sublimating the context to which it connects. When a photographer prefers to say that they '*make'* a photograph this subtle linguistic distinction is a move toward the intra-active paradigm that material ecocriticism posits (ibid). '*Making*' a photograph suggests an interactive process, the photograph being the material artefact or record of the photographer's active encounter with place as mediated through the camera. The *intra-active*

agencies (Barad, 2003, 2007, 2014) of the camera programmes, film, light, chemicals are as performative as the activity of Bendiksen himself; the entire photographic ecology become performative forces in response to one another. At the same time, Bendiksen becomes a performative force in the hand of his camera in terms of what his entangled relations can make seen and unseen. His photographs render tangible some of constitutive participants of this interactive process: the affect that draw 'subject objects' together; the light differentially reflected off the objects and refracted into the chemistry of the film; the inbuilt camera configurations; the occurrences of possibility and chance. These materialisations also cast photography's indexicality in a new light: rather than a "trace" or "quotation" (Berger, 2013, p.51, p.69) or the *taking* of a given object, these photographs very clearly show a relation. As Joanna Zylinska asserts, "it is precisely in its nonhuman aspect that photography's creative, or world-making side can be identified" (2017, p.9).

Discussions of co-creation between humans, machines, and environment as a meshwork (following Ingold, 2007), and calls for the role of the human to be decentralized, raise important debates about the nature of creativity in photography. The last few decades have seen a growing recognition of the problematic distinctions between 'nature' and 'culture' that once underpinned scholarship in the humanities and sciences, and which continue to shape divisions in academic disciplines (McLean, 2009, p.215). By recognising and refiguring the 'organism' [38] the photographer works within, this thesis proposes a relational ecology of film and photographic practices. Rethinking photographic practice in this way

[38] There are many nuanced understandings of 'organism' in philosophy, but most originate from Whitehead's (1978) process philosophy. More recent discussions from enactive theory of mind (Thompson, 2007; Varela et al., 1993), discuss cognition and perception as grounded in the sense-making activity of the organism, which is coupled to an environment. The organism both initiates and is shaped by the environment; organism and environment are bound together in a reciprocal activity of specification and selection. The organism's perception and the 'features' of the environment are both enacted, 'brought forth' through the movement and activity of the organism coupled with its environment. According to Merleau-Ponty (1942), the artist's 'behaviour' – their bodily gestures and movements – lies at the centre of an organism-environment coupling, through which the 'texture' of the environment (an affective environment made up of energetic forces) is made visible through the activity of painting itself.

aligns with studies that resist dominant and *hylomorphic* constructions of creativity (this term/concept is discussed below), that privilege form over relationships and processes (Deleuze and Guattari, 2004; Gatt and Ingold, 2013; McLean, 2009). This *hylomorphism* has led to "an exclusive preoccupation with cultural creativity as a specifically human mode of engagement with the world: that is, regardless of how creativity is defined, it is human beings who alone are shown to practice creativity" (McLean, 2009, p.214). This view constructs non-humans as simply canvases, tools, and handmaidens of human imagination and endeavor while discounting the possibility of creativity as immanent to the material substance of the universe (Crutzen, 2006; McLean, 2009).

4.5 Rethinking cause and effect towards a process ontology for photography

One consequence of the simplification of the causal relationship is that the dynamics of the multiple agencies involved in *making* a photograph are flattened into a single agent that is contained in the image. Conventionally, causality seems to be understood as a direct opposite of agency: a relation of cause and effect that is deterministic, predictable and not necessarily dependent on individual action (Kinnunen and Koskinen, 2010). This deterministic understanding of photography would support ideas such as the index, automatism, reproducibility, truthfulness, record and the real. Art history's anthropocentric model of the emergence of artworks, appears to have distinct resonances with an Aristotelian teleological model of causality. Although Aristotle was concerned with the analysis of 'becoming', or substantial change, he offers a teleological explanation of the production of art objects. That is to say, an explanation that makes a reference to the telos or end of the process, a model that involves a purposive agent who is somehow sensitive to the end (Falcon, 2019). Following on from this, Aristotle's *hylomophic* construction of creativity (*Hylomorphism* – from Greek hylē , 'matter'; morphē , 'form' (Encyclopedia Britannica, n.d.) was used to describe a mode of creation where form is imposed onto matter. In the subsequent history of western thought, this hylomorphic

model of creation became ever more deeply embedded but it also became increasingly unbalanced. Form came to be seen as imposed, by an agent with a particular end or goal in mind, while matter – thus rendered passive and inert – was that which was imposed upon (Ingold, 2010). An example of this line of thought in photography shows up in the tendency for history to consider the camera as an uncomplicated extension of the photographer's body, one that simply reflects instinctive wishes and desires. If we think about causality as being nonlinear then it allows us to expose, in Aristole, certain assumptions about the hierarchy of human influence. As a continuum of this way of thinking, photographic history and theory overidentifies the process of capturing a fleeting moment with a focus on the all-intentional photographer and their shrewd reflexes and superior vision, as if they are the sole agent in the photograph's production. Furthermore, using the term, 'the decisive moment' privileges an assumed direct correlation between the photographic image and the world and deprives the process of the complexity in the causal relationship. If one entertains a reductive model of causality it would follow that one will buy into the mythology of Cartier-Bresson's decisive moment. Yet, there are other models of cause and effect that dispel the myth of being in the right place at the right time and introduce a discussion of the 'will' of other non-human 'matter' into the equation. As discussed in chapter three, factoring in non-human agency of material things brings with it that which is unpredictable and arbitrary, and introduces chance into the process. Additionally, some of the causal forces of non-human actants and agents delimit human agency and the ability to act freely and move forward with intention.

Widespread discussion by philosophers over the last forty years has cast doubt on the adequacy of any simple analysis of singular causation. A cause – effect connection that is considered a one-way, one-directional action is mostly characteristic of mechanical causality (Menzies and Beebee, 2019). In most cases, however, such an approach does not work because things are not inert but charged with internal activity (agency). Therefore, in

experiencing effect, things in turn act on their cause, and so the resulting action is not one-way but an interaction. Since causal connections and interactions have neither a beginning nor end, they are as infinite as the universe itself, it is therefore more useful to rethink causality in terms of process. One view that has prevailed, proposed as a metaphysical principle in process philosophy, is that every cause and every effect is respectively some process, event, becoming, or happening (Whitehead, 1929). In general, it is agreed that, a process has many causes (Seibt, 2018).

The natural roots in process philosophy trace back to the pre-Socratics – famously through Thales' *hylozoist* (from Greek *hylē* for matter and *zōē* for life) conception of matter as alive and moving radiating energies through a mind-like nature, and later through Heraclitus' energeticist worldview of ever-changing nature and motion: *panta rhei* 'all is flux' (Gosden and Malfouris, 2015). Philosophies that emphasis process, change, and non-human agency have acted as correctives to static thinking about causal laws and determinism. Yet, in spite of its long association with various 'process-isms' photography seems still lacking in a unified philosophy of process. The notion of 'process' has largely been taken for granted and thus, trivialised.[39] The emergence of photographic artefacts requires a closer look at the whole in which the parts, e.g. photons, electromagnetic and chemical processes, time, events, technological advancements, photographer's cognition, apparatus, data processing, editing, printing, distributing, social histories and transformations, culture, networks - circulate as a meshwork of interrelated processes at different micro- and macro-scales of human and non-human life.

Whitehead's metaphysics described a universe in which all entities, such as these, experience. An actual entity is a process and is not describable in terms of the

[39] After the proliferation of new materialist theories, one notable author, Johanna Zylinska (2017), has attempted to understand some of the dynamics of process in non-human photography, where photographic process is largely automatised and subject to the logic and vision of the machine.

morphology of a "stuff" (Whitehead 1978, p.41). For Whitehead, human perception and cognition have no special or privileged status, because they simply take their place among the myriad ways in which all actual entities prehend other entities. His term 'prehension' includes both causal relations and perceptual ones—and makes no fundamental distinction between them. Ontological equality comes from contact and mutual implication. All actual entities are ontologically equal, because they all enter into the same sorts of relations. Whitehead's key term prehension can be defined as any process—causal, perceptual, or of another nature entirely—in which an entity grasps, registers the presence of, responds to, or is affected by, another entity. All actual entities constitute themselves by integrating multiple prehensions; they are all "drops of experience, complex and interdependent" (Whitehead, 1929 p.18). Photographic theory has yet to bring together and consider the interrelatedness of these entities which include human cognition and perception in a more inclusive 'process ontology' that would allow for a better understanding of the various energies and agencies that co-produce photographic artefacts and clarify the process in which images do not merely represent events but are themselves continuous with and materialised as events.

Outside of photographic discourse there are various recent trends of thought in many research fields that theorise complex procedures or processes and attempt to characterise the kind of relationality obtaining between its parts[40]. Discussion of process philosophy, especially deriving from Alfred North Whitehead (1978) Henri Louis Bergson (1907) and Gilles Deleuze (1993), are not new in archaeology and anthropology. In fact, it is becoming increasingly influential mainly through the work of several contemporary thinkers like Tim

[40] Process theory differs from theories such as complexity theory in which the study of how large numbers of agents, entities or systems interact with each other (crowds of people, the spread of an epidemic, the stock exchange) is used to create a mathematical or computational model of system dynamics for the purpose of making predictions; and complicated systems are machinic systems like an engine which can be designed, its behaviour can be predicted and controlled (In Our Time, 2013).

Ingold, Bruno Latour and Philippe Descola, who, in spite of their important differences, share a new emphasis on becoming rather than being. From Ingold's (2007, 2008, 2010, 2012, 2015) persistence at bringing things to life through his philosophical anthropology of lines and ecology of materials, to Latour's (2005, 2013) symmetrical anthropology of actor networks,[41] to Descola's (2013) ontologies of animism, totemism, analogism and naturalism, the influence of process philosophy is noticeable. Similar trends exist across the humanities, in philosophy (Manning and Massumi, 2014; Roberts 2014) and social sciences, for instance, in Andrew Pickering's (1995, 2009) metaphor of the 'mangle', which rejects the ambition of explaining the development of science in terms of fixed and pre-existent causal factors. In the cognitive sciences, theories of embodied, embedded, enacted, extended and distributed cognition advocate that the mind and the environment act as a 'coupled system' based on the active role of the environment in driving cognitive processes (Bateson, 1972; Clark and Chalmers 1998). The growing attention to notions of 'vital' materiality (Bennett 2010), animistic ontologies (Alberti and Marshall 2009), and material agency (Knappett and Malafouris 2008; Gell 1998), as well as the recent proliferation of 'new materialisms' (Barad, 2007; Barrett and Bolt, 2012; Coole and Frost, 2010; Braidotti, 2013) who share an agenda with posthumanism, all seek to reposition the human among nonhuman actants. At the farthest extremes of this thought are the speculative realists (De Landa 1997, 2016; Harman 2011, 2018 ; Meillassoux and Brassier, 2017; Shaviro, 2014) who are concerned with the problem of how to describe the world as it really is, prior to all human access, or object-oriented ontologies (OOO) that reject the privileging of human existence over the existence of non-human objects (Morton, 2016; Connolly 2011). These theories have an important currency for rethinking ontological, ethical, and political foundational questions related to all human practices including photography. For photography these pertinent ideas are useful for factoring into photographic practice the

[41] The extensive literature on actor-network theory is usefully summarized at the Actor-Network Resource, www.comp.lancs.ac.uk/sociology/ant.html.

recognition of the complexity of the world by proposing that reality isn't populated by fixed objects with boundaries but rather a meshwork of temporalities. When we understand causality is everywhere at once, and non-linear (Delanda, 1997) then we address the messiness of reality and the photographers ongoing process of negotiation within it.

As we move about within the world, relational meshworks are generally understood quite intuitively. They unfold in time through the flow of our lived experience. Our conscious attention is not drawn to each and every actor or actant in a given situation. It is not a process we tend to make explicit to ourselves since it is how we naturally perceive, cognise, understand and make meaning, or at least, until something breaks down or stops working for us. Since the development of scientific theories of "self-organization," "chaos," and "complexity" have begun to alter our understanding of evolutionary change, there is a new need for a metaphysics that can accommodate all sorts of phenomena where dynamic organisations exert causal constraints (Seibt, 2018). Many process theorists and philosophers have attempted to articulate the dynamic potentialities offered by the study of the interrelated relationships between the human and the non-human for various purposes. For instance, Deleuze and Guattari (1987) draw from dynamical systems theory, which explores the way material systems self-organize, to create an assemblage theory[42] which provides a bottom-up framework for analysing social complexity by emphasising fluidity, exchangeability, and multiple functionalities through entities and their connectivity. Following Gilles Deleuze, Jane Bennett (2005) adopts the term assemblage to describe the

[42] Following Gilles Deleuze (1987) - An assemblage is, first, an ad hoc grouping, a collectivity whose origins are historical and circumstantial, though its contingent status says nothing about its efficacy, which can be quite strong. An assemblage is, second, a living, throbbing grouping whose coherence coexists with energies and countercultures that exceed and confound it. An assemblage is, third, a web with an uneven topography: some of the points at which the trajectories of actants cross each other are more heavily trafficked than others, and thus power is not equally distributed across the assemblage. An assemblage is, fourth, not governed by a central power: no one member has sufficient competence to fully determine the consequences of the activities of the assemblage. An assemblage, finally, is made up of many types of actants: humans and nonhumans; animals, vegetables, and minerals; nature, culture, and technology.

dynamics of an electrical power grid in order to give an account of the blackout that struck North America in August 2003. She uses this example to investigate some of the practical implications for social scientific inquiry and politics, and for a notion of agency that crosses the human-nonhuman divide. Tim Ingold's work addresses the varying forces and messiness of a 'meshwork' articulated through the act of making,[43] Feminist physicist Karen Barad (2003) coined the term intra-action as the mutual constitution of entangled agencies. Whilst 'interactions' defer and deflect responsibility, in intra-actions responsibility is distributed amongst the constitutive entities. Thinking with intra-actions means giving up cause and effect relationships, individual agency and subject-object dichotomies in order to rethink the artificial boundaries of thought and action we have forgotten we invented.

These kinds of networks/ meshworks/ assemblages or intra-action theories are not intended to enable the creation of strategies, algorithms, or computational models to make future predictions. They are incomplete, and with no potential function for anyone or anything. In contrast to those theoretical models that see the relationship between mind and life, or, mind and matter, as one of Newtonian cause and effect, Cartesian representation or some other form of action at a distance, a relational understanding of photographic process, is one of ontological continuity; endowed with different degrees of consciousness whose manifestations can be found in varying kinds of intelligences throughout nature. The photographic image itself may be static, a snapshot in time, but nothing we see in that image (or even the photograph itself) is timeless, motionless or inert, rather, every component (biological or non-biological) engages in continuous mutual perturbation, with each component continuously influencing the other's action potential.

[43] Ingold's chooses topics which are much more hand focused and always about the immediacy in making e.g. a fingerprint in the clay leaves its trace which then gets fired, whereas some processes, such as photography, produce a delay. Although his work is useful for discussions about photography, he doesn't incorporate the process of mediation that photography insists upon. Digital photography gives the illusion of immediacy, but the delays are deferred.

There are no subjects, no objects, only becoming. To use Whitehead's (1925, p.93) terminology we witness a processual 'event' or 'actual occasion' in the life history of this thing, a flow of energies within and between varieties of materials.

Returning to Bendiksen's contact sheet, in the twelve images from 24 to 35 where the peak of the action seems most distilled, the black strips between frames also have a greater affective quality. Here these strips provoke a reader to imagine what Bendiksen almost shot, the infinitely divisible moments in between gesture, composition and coincidence that might have resulted in something even greater. It is here that the images, together with the gaps, reveal something larger than the images themselves. The continuous images within the contact sheet provide access to the self-corrective, continuous process; a living flow, direction and momentum between the photographer, their experience, the affordances of the camera and the dynamics of the environment that results in Bendiksen's iconic image.

Talking in terms of a relational causality opens the way for thinking about the decisive moment as a thick event rather than a fractional second, inviting reflection from philosophical positions that can accommodate processes rather than instances. This chapter has reread a contact sheet to draw attention to potential discussions of other human, object and material agencies that support the social intention of the documentary photographer. What does this mean for the 'decisive moment'? Bendiksen has worked the scene, but he could not have anticipated the storm of white butterflies, nor the diversion the horse takes across the road, or the way in which other people and objects also might have responded to the moment upon them. In contrast with the single image, the contact sheet is evidence for a counter-causality; where the photographer works within a continual process of negotiation with diffractive patterns of difference. By describing and reconstructing this complex process of co-collaboration of elements through a reading of the contact sheet from the perspective of an experienced photographer, this chapter has

sought to show how the photographic process might be thought about as a co-produced resonance between affective objects, people, landscape. The precariousness of how some of these photographs come into existence is striking. Not only because any one of these elements or agents might not have composed itself in a way that made 'the moment' present itself to the photographer, but perhaps even because the photographer might have responded too late. Rather than see the photographer as the central driver of photographic artefacts, the photographic series of the contact sheet can show up how uncooperative or unpredictable the world can be, drawing attention to the importance of thinking about creativity and the decisive moment as contingent to a world that is rarely as compliant as an single shot might make it appear.

4.6 Conclusion

This chapter has reframed the Bendikson's decisive moment as distributed across corporeal and material dimensions of reality showing that causality isn't a linear process. The contact sheet shows how photographs are the manifestation of a larger self-organising system of which the photographer is part of and responds to. We see how Bendiksen's intentions, far from being autonomous and fixed, are open to influences from many other entities. This demonstrates how human history is not under human control but derives from negotiations with many types of processes from publishing conventions, the camera apparatus to processes of matter and energies in nature. These continually open up new spaces of possibility and negotiation with no clear direction or pre-determined outcome. Introducing discussions from new materialism and process philosophy opens the way for a more complete understanding of the different play of energies and model of causality in support of a relational ontology of photography.

Although there is a play of modesty in Bendiksen's description there is a pre-existing idea of what a good image should be already strongly influenced by the Magnum aesthetic and

their commercial imperatives. Magnum Photos' classic visual style is a crossover between photojournalism and art – it's about exposing the drama. Bendiksen would be unlikely to reveal how this style might influence his photographic choices 'in the field', but it certainly influences the final resolution of the finished image for publication. A simple causal relation satisfies Magnum's brand and sustains their mythology. However, this dominant style remains the definition of "good" photojournalism and thus has important implications for the way viewers perceive events that are mediated through photojournalism. The authority of Magnum's master style means there is an exclusion – of all the images that were not 'dramatic' enough – and this exclusion creates a slipperiness in 'documentary' claims to photography. Subsequently, the wider implications of these dominant narratives and ideologies of popular commercial media get into the mainstream media and affect content and the construction of search criteria. These points will be picked up in a discussion about automation and apparatus and evidenced through close examination of a contact sheet in the final chapter.

Chapter Five: The Photographic Moment and the Networked Nature of Cognition

How do we discuss a human practice such as photography in a way that does not privilege the human but rather, considers photography as a relational ontology, in which the human is a significant but not overriding determinate of the image? The full complexity of the relations in the photographic image will almost certainly be an infinite network of strong and weak forces. Photographic practices corral or marshal energies that are beyond the photographer and the photographic apparatus in order to reveal aspects of the world that are not entirely visual. For example, in sports photojournalism, the depiction of the moment that a goal is scored requires not only technical skill and visual sensibility but also an understanding of the experience of both playing and watching (and supporting) a football team. Crucially it also requires an understanding of how a photograph is read when it later appears in the world.

Using historical and contemporary examples of photographic practice taken from sports journalism, this chapter traces the wider cognitive states and processes that go beyond individual minds to show that both human and non-human agents form integrated systems for performing information-processing tasks (Heersmink, 2017). Based on the situated cognitive approach we can understand cognitive activity as extended beyond the brain to non-neuronal parts of the body, through and with the camera apparatus and elements of the environment. This creates an alternative model of vision (and therefore photography), in which the eye is understood as one component within broader processes of visual perception, themselves nested within other sensory and agential systems as a necessary part of a relational organism. This relational mode of seeing (which could also be considered posthumanist) where the photographer's cognitive resources are shared, would allow them to accomplish something that an individual agent could not achieve alone.

In the previous chapter it was shown how as a photographer works in unison with a world which is in a continuous state of emergence, thereby offering an understanding of photography that comprises a non-linear model of causality. However, where the geographical meshwork is spread out (ie. over a football pitch or a city) to the extent that a single photographer is not able to undertake the task alone, the photographic approach requires a different model of vision and cognition. This chapter makes tangible some of the cognitive negotiation and distribution of decision-making behind the documentary sports image. Sports reliably offer contained dramatic situations, which can be used to challenge and highlight photography's potential to freeze movement and condense meaning into a single image. However, when sports reportage photographers (and cinematographers) work with the conventions of their field, in order to arrive at the seamless documentary image – the one that brings the viewer as close as possible to the peak sporting moment – the complexity of the production process is covered up. Using an account from a helicopter cinematographer for the 2019 Cardiff Half Marathon as a starting point,[44] this chapter will begin to illustrate how we can think about photography if we consider cognition as distributed through a large and possibly infinite meshwork of agential factors. As the technological photographic and filmic system becomes complicated, networked and subsequently more obscured in the shift from analogue to digital, behind the seamless broadcast image an even wider extension and distribution of decision making can be traced amongst a complex arrangement of human and non-human determinates. It will be shown that in order to manage the immeasurable variables during the filming of a live sporting event, and particularly when the parameters of time and space are extended, the cinematographer offloads cognitive work onto the technological apparatus to coordinate action.

[44] This account is given by Shane Smart a helicopter cinematographer working for Amis Productions, with additional personal observations, having been given the opportunity to witness the helicopter filming process first-hand.

Despite the scale of the implied meshwork, the coverage of the Cardiff Half Marathon illustrates the contract between the photographer, apparatus and the environment at its most fundamental. Some might consider there to be a technological simplicity in the way a single photographer works with a camera. However, the chapter will show how many of the features of the meshwork, in which the helicopter is a part, are embodied in the work of the lone photographer photographing the match. Using Dutch photojournalist Kees Molkenboer's football contact prints as a starting point, this chapter will discuss how the photographer, while often condensing an entire football match into one spectacular image of a moment, engages a distributed cognitive process which is wholly integrated with his environment. The close reading of this particular contact sheet will provide an analytical framework for understanding the fundamental determinates in more complex technological photographic systems. I use this artefact from medium format analogue photography since it shows a very concentrated level of human cognitive interaction when working with the tightest restrictions. This chapter indicates how the documentary photograph as a collaborative network is a model of distributed cognition which is not confined to human intelligence but is inherently fused with the apparatus.

5.1 Cognising the technological meshwork

The following is a video still image of Leonard Langat taken while running in the Cardiff Half Marathon (see fig. 8). It seems to be a very straightforward shot recorded by a camera in the right place at the right time. It is in fact an image that is consequent on an elaborate network of devices (a *dispositif*) in which human agency is decisively present but at a great technological resolve.

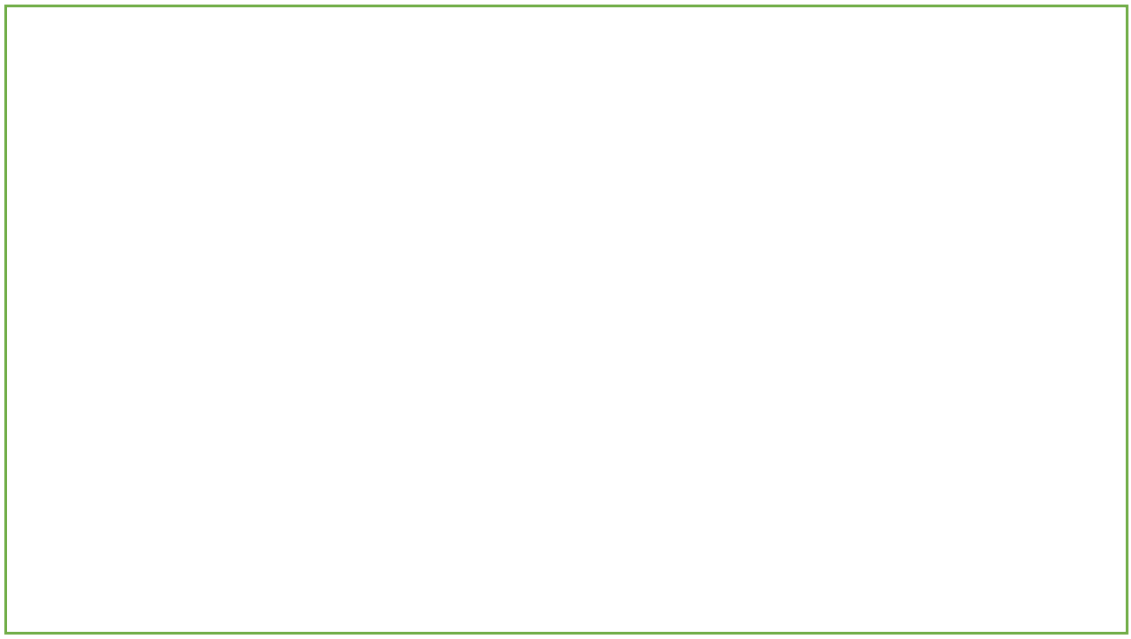

Fig. 8 Video still of live BBC coverage of Leonard Langat and the lead runners in the 2019 Cardiff Half Marathon has been removed due to Copyright restrictions.

On Sunday 6th Oct 2019 at 10:00, 27,500 runners took part in the Cardiff Half Marathon, the UK's third biggest race after the London Marathon and the Great North Run. Two Kenyan runners won the 13 mile race - Leonard Langat in fifty-nine minutes twenty-nine seconds and Lucy Cheruiyot in one hour eight minutes and nineteen seconds. The BBC televised the marathon live through a production company called Timeline Television who were contracted to provide all the broadcasting technical facilities and HD 4K production for the race. In order to capture the event live, Timeline delivered radio frequency outside broadcast facilities that included high-end equipment and expertise using wireless cameras on motorcycles, helicopters and aircraft to fully cover the event. The captured footage was then edited live by another contracted sports production company called FilmNova.

A plan (see fig. 9) of the division of labour for the documentary task – the camera positions and radio frequency facilities – is given to the production team by Timeline Television. The plan shows three motorcycle-mounted cameras that relay the pictures via a fixed-wing aircraft circling overhead at 25,000 feet. The company claim that it has

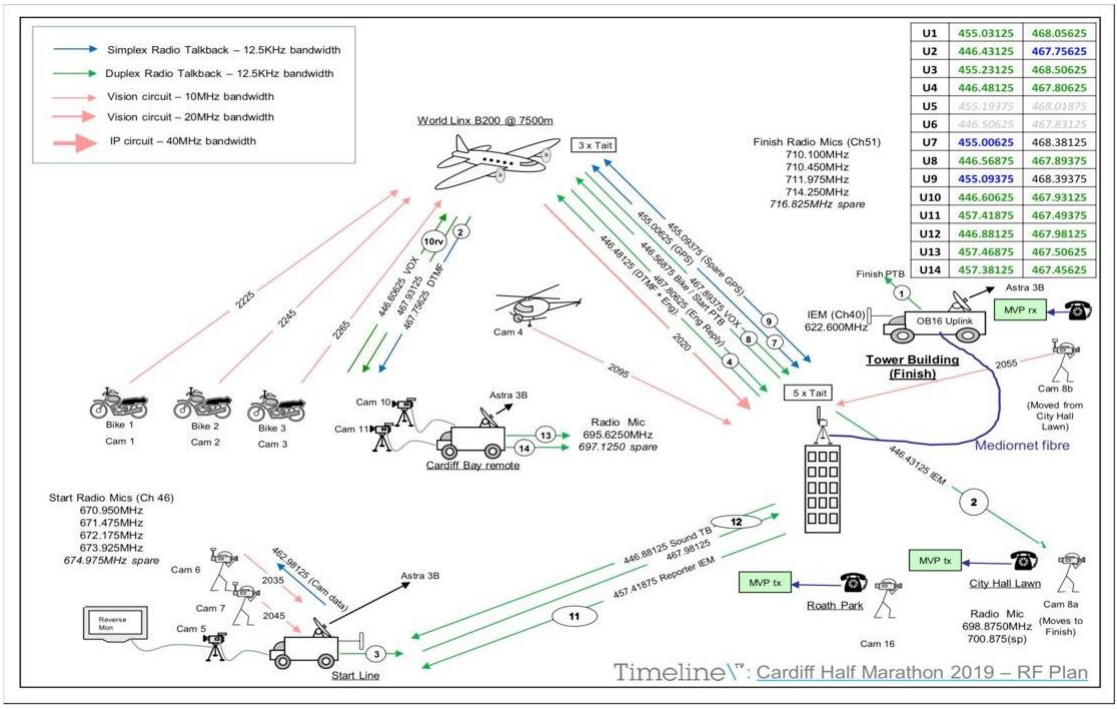

Fig. 9 Plan showing all the RF facilities provided by Timeline Television for the 2019 Cardiff Half Marathon. Permission to reproduce image has been granted by Timeline Television Ltd.

developed robust airborne systems using state-of-the-art technology to give unbroken high-quality pictures as the motorbikes weave through the city streets. The start of the race is covered with two remote radio cameras, mid-pointed over local buildings in order to transmit back to the main production truck. Overhead a live link video from a helicopter mounted with a Cineflex camera provides aerial context shots and follows the action on the ground. As the runners pass through Cardiff Bay, they are filmed next to the Senedd (Welsh Assembly building) by two-camera remote site, linked back via satellite to the finish. These multiple perspectives are knitted together in a necessary seamless live broadcast by a creative director, although in this case the role of director is more a coordinator, another agent in the meshwork.

At the start time of the race the weather forecast reported partly sunny with highs of sixteen degrees and lows of fourteen degrees with sixty-nine percent humidity and a north westerly wind of nineteen miles per hour. It had rained the night before, by 10am the

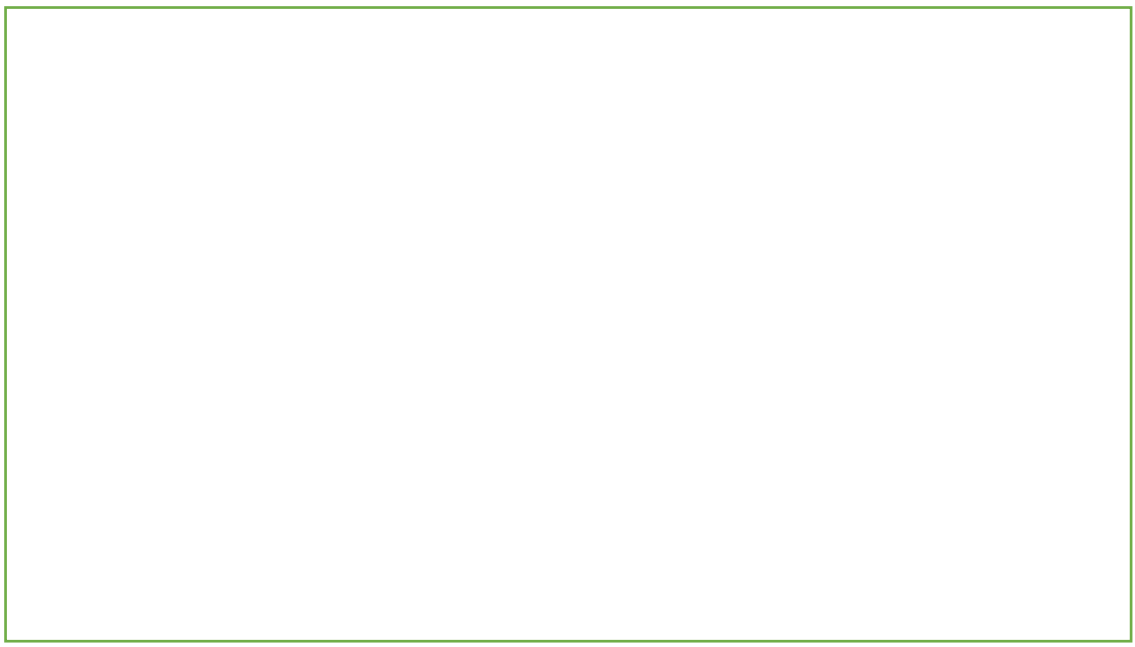

Fig. 10 Video still of live BBC coverage of runners in the 2019 Cardiff Half Marathon has been removed due to Copyright restrictions.

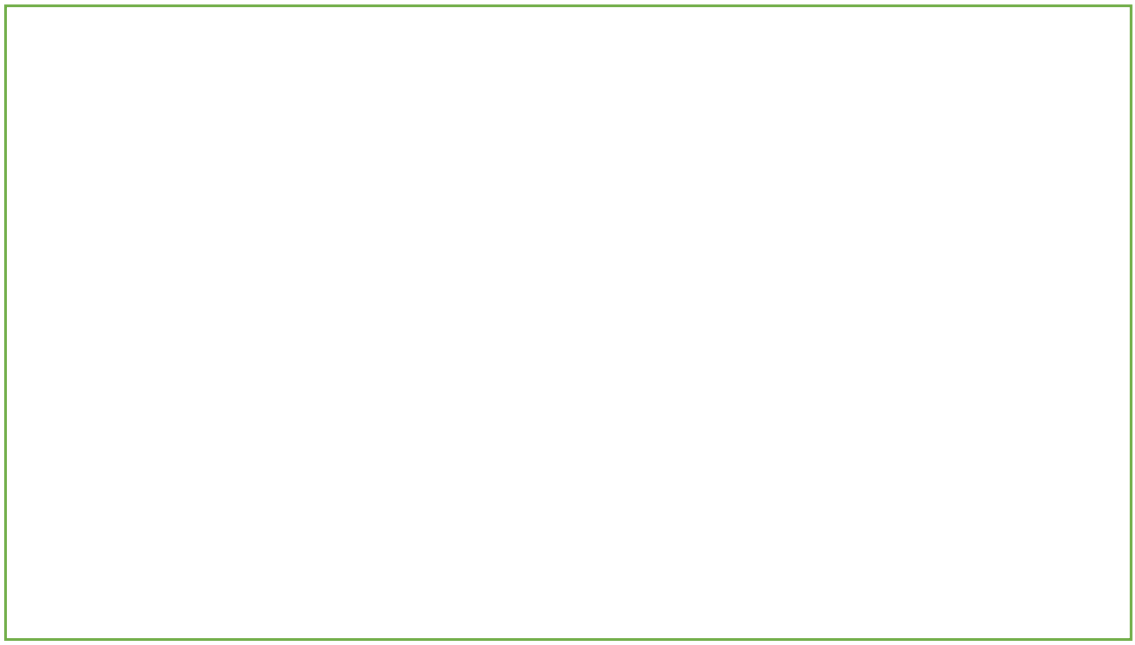

Fig. 11 Video still of live BBC coverage of lead runners in the 2019 Cardiff Half Marathon has been removed due to Copyright restrictions.

sunlight was bright and sharp, and the atmosphere was clear, these were perfect conditions for both the runners and spectators. However, the weather conditions for the helicopter cinematographer, tracking a lone lead runner wearing black and white sports apparel through the city streets, were proving challenging. The intense sunlight had created strong dark shadows from the buildings and trees which cast across the roads and contrasted with

strong shafts of sunlight in between (fig. 11). The helicopter gyroscopic camera with high dynamic range, powerful digital zoom and an automated tracking feature which locks on to a moving target couldn't determine or hold focus on the runner through the intense difference between light and shadow. The camera technology was pushed to it limits by the light conditions. During the live broadcast this key aerial shot of the marathon had to be abandoned in favour of a different view from the ground.

Later in the race a squall of rain and wind came in from the bay area, the camera drones were sent back to base since they cannot operate in the rain. The aerial shots from the helicopter trace the runners along the bay coastal road which also offers a desirable aerial context view of the city and coastline. At the fore is the need for the most dynamic shot – the image that shows the most drama, speed, energy and movement and the commissioner's expectation for a certain quality of footage. Documentary footage of marathon races tend to be fairly banal and straightforward images, intersected with prerecorded features about particular runners. Yet despite its straight documentary approach, there are an extraordinary amount of restraints working against the 'ideal shot' beginning with those imposed by the helicopter's own set of technical limitations and the safety regulations enforced by the Civil Aviation Authority (CAV)[45]. The helicopter camera operator is continually framing the best possible shot in each given moment, anticipating the switch to his camera footage for the live broadcast. Whilst he co-ordinates his task he must synchronise those activities with other interconnected actors in the meshwork. The cognitive property of the film production meshwork is produced by the collective interactions among its parts. The camera operator listens to four voices through his headset; the commands of the live television director, the BBC live commentator, the pilot and air traffic control, each with their own very different agenda and operational language.

[45] For example, the maximum number of daily flying hours which a pilot may be permitted to undertake are three hours, including flight preparation, transmission testing time, refueling etc. The pilots flying time is tightly scheduled, divided between all the races to ensure maximum coverage.

Effective communication and description are key to the task as each cognitive and computational process lie both inside and outside the body of each practitioner in action.

To stay in signal for the live broadcast the helicopter pilot must fly within the boundary positions of the receiver from the signal tower. Flying over the bay, the helicopter pilot needs to be mindful not to draw the wind away from any camera drones and sailing boats directly underneath. The pilot positions the helicopter over the sea so that the cameraman can face the camera away from the driving rain since any water on the lens can only be cleaned after landing, or alternatively he will need to adjust aperture and ND filter to shoot through it.

Fig. 12 Live programme editing of the 2019 Cardiff Half Marathon at FilmNova sports production. Permission to reproduce image has been granted by FilmNova.

The helicopter cinematographer is just one component in a wider collaborative meshwork of other processual agents that contribute to the live broadcast. Each individual component in the meshwork is managing its own set of variables, and other systems within systems, as they gather footage whilst simultaneously being cognisant of their contribution

to the live broadcast.[46] Although the plan in Fig. 9 shows the normative procedures and is a good starting point to provide a framework within which the properties of the complex film system can be described, it is clear that it does not provide a representation of individual, stable procedures nor a definitive network of all the possible processual agencies in action. Also not recognised in the plan are the most potentially vibrant and disruptive agents such as the weather, electricity and electromagnetic waves, all of which are integral to the smooth running of the live broadcast. In addition, distributed memory (Roberts, 1964), along with each individual's life experience and character can be one of the biggest cohesive or disruptive powers in a collaborative task.[47] As members of the film production team form a flexible connective tissue to maintain the collective goal in the face of a range of contingent events, these co-dependencies shape the pattern of behaviour of the group. In the end, the hierarchy is flattened as nature has the final say. Nature is ultimately the live director and producer of images. It is precisely these autonomous agencies, energies which cannot be corralled or marshalled for human endeavour that require the photographer to be compliant, enforcing them to take a more improvisational approach to their task and to modify their aims as they proceed.

Although this meshwork takes place over one and a half hours and twenty-six miles, it has required this enormous network of collaboration, distributed decision making and individual sensibility towards a seamless image. Some might consider there to be an absence of technological complexity in the way a single photographer works with a camera,

[46] This dynamic is also the subject of *Deep Play* (2007) by Harun Farocki which similarly exposes the technological infrastructure behind the football game. He uses this idea as a creative strategy to comment on the radical change in European public television in the 1980s and '90s, when TV became more homogenized and the broadcast spaces that used to be available to directors like Farocki for more experimental films disappeared.

[47] Roberts (1964) suggested that a cultural group can be seen as a kind of widely distributed memory. Such a memory is clearly more robust than the memory of any individual and undoubtedly has a much greater capacity than any individual memory has. Roberts speculated on how retrieval from the cultural memory might be different from individual memory retrieval and how a variety of social organisational devices might be required for the continued support of memory retrieval functions in increasingly complex cultures.

yet many of the features of the meshwork, in which the helicopter is a part, are also found in the *dispositif* surrounding the lone photographer. Despite its ambition and scale, the coverage of the marathon re-enacts the contract between the photographer, the camera and their environment at its most fundamental to achieve recognisable photographic sports images.

5.2 A contact sheet by Dutch photojournalist Kees Molkenboer

The video stills of the marathon runners draw on the conventions and expectations of sports imagery that accommodate the spatial and temporal extent of the event by technological amplification of the basic contract between camera, world and photographer. There are some exceptional and extravagant technological additions but at a schematic level they simply repeat (and make explicit) the processes when an individual photographer is, for example, standing on the goal line at a football match. This moment here is particularly decisive, a split second, but the following close reading of the contact sheet will describe the cognitive meshwork that constitutes it.

These contact prints by Dutch photojournalist Kees Molkenboer (see Fig. 13) feature two separate football matches taken on the same day, February 25, 1952. The first two images were taken at the Olympic Stadium, Amsterdam and the last four images taken at Feyenoord Stadium, Rotterdam. A close reading of Molkenboer's contact prints makes tangible some of the cognitive negotiation and distribution of decision-making, reveal the co-authorship of his creative process with technology, culture, and other non-human agential matter, material forces and physical processes. This method will not explain 'why' or 'how' a meshwork takes the form that it does, nor can it disclose how to harness and measure the conditions of a creative moment in order to understand the mechanisms of it. Rather, this is a method for understanding the manifestations of human engagement with matter, exploring the relations within a meshwork when human and non-human

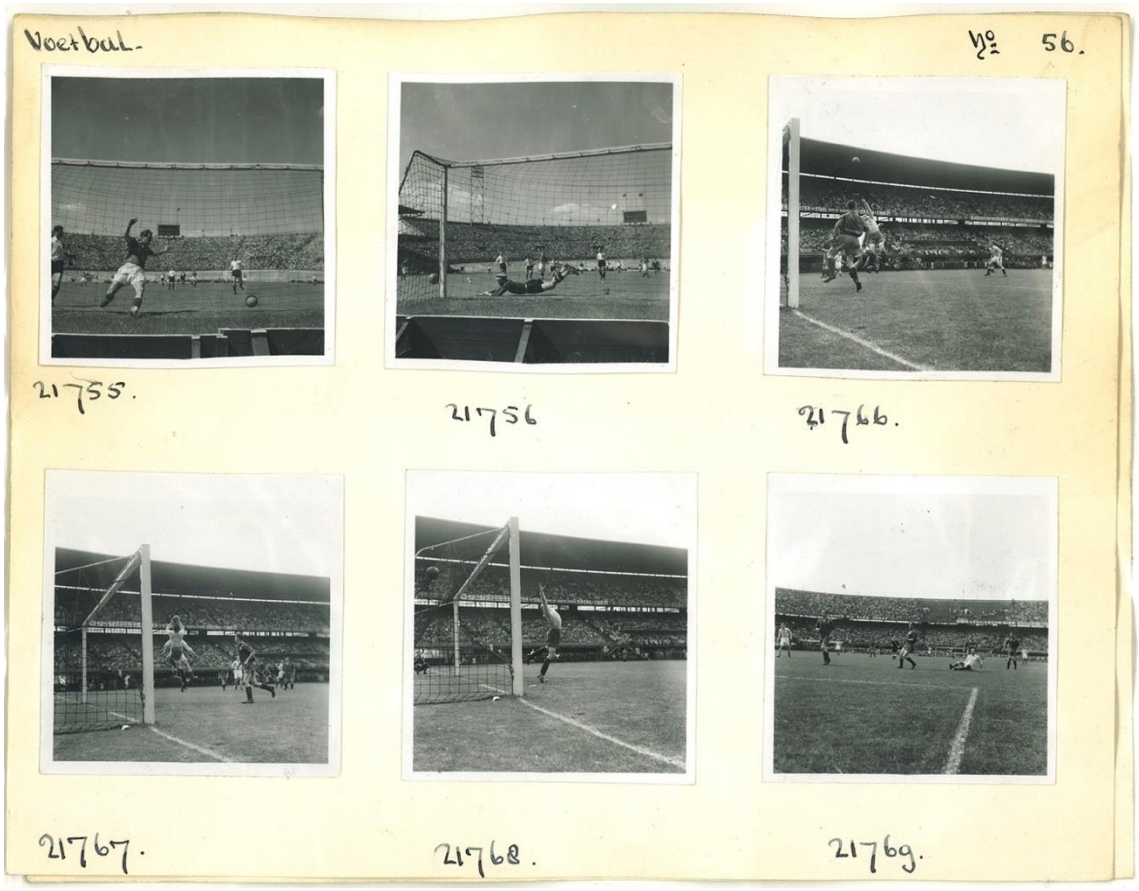

Fig. 13 Voetbal contact print no.56 by Kees Molkenboer featuring football matches at Feynord Stadium, Rotterdam and Amsterdam Stadium, Holland. Permission to reproduce image has been granted by © Kees Molkenboer / Nederlands Fotomuseum, Rotterdam.

meshworks come together to act as a whole. For photography, this approach reconsiders the impression that the photographer creates a representation of the world that is separate and stands apart from the photographer. When it is recognised that the world is an active agent, the world as an agent is playing a role in the co-creation of the artefact.

5.3 Seeing as a consensual action with the apparatus.

In common with other professional photographers of the time Molkenboer photographed at his own expense and sold his photographs to newspapers and journals in Rotterdam. The archive of his contact prints, held in the Nederlands Fotomuseum, shows a photographer with an economical way of working, almost certainly a consequence of his self-employed status. Typically, Molkenboer would use one roll of 120 medium format film

to photograph two matches in the same day. He preferred to use a 6x6 twin lens reflex (TLR) camera, a Rollieflex with a 75mm wide-angle lens. This camera gave him a maximum of 12 exposures per roll of film. When I am looking at Molkenboer's contact prints, my primary understanding is that these photographs were manufactured by a visually intelligent mind with technical competence, experience, sensibility and understanding.[48] As we can see (also in Flusser and Ihde), the degree to which the instrument itself is in dialogue with the visual intelligence of the photographer has some agency itself in determining the final image. The camera is not simply procedural and cultural, but ontological; it has a being of its own and seeing is a consensual action with the apparatus. In these symbiotic relationships between perceiver and technology, perception as a mode of embodied engagement with the world is enabled, transformed, reduced or augmented through the mediation of the instrument (Idhe 1990, p.86).

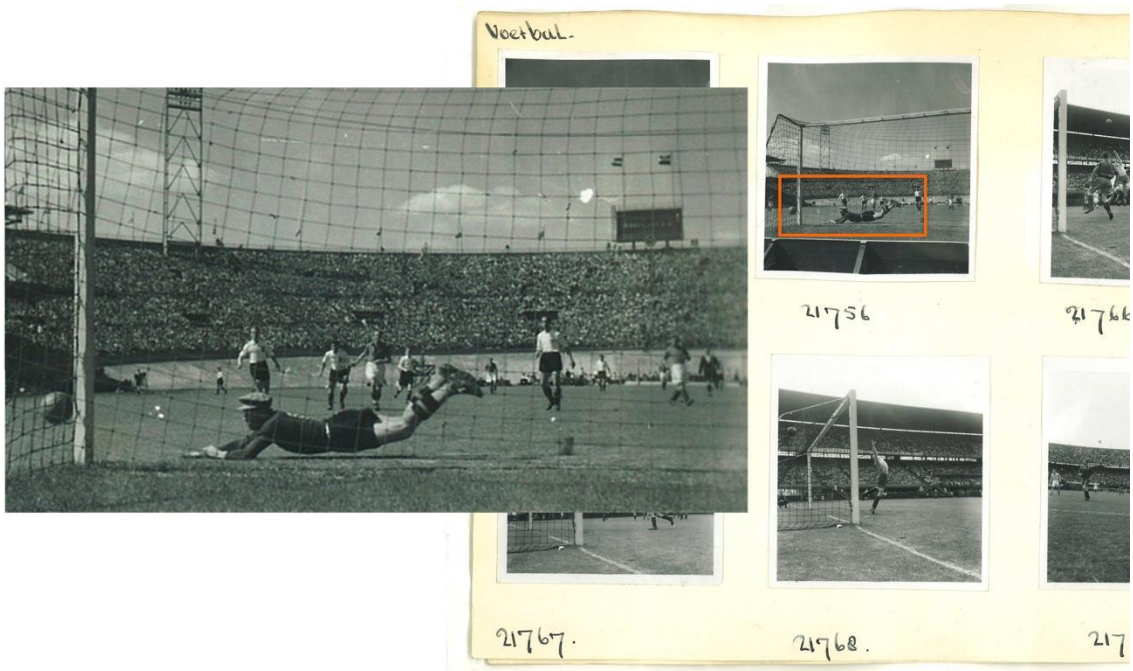

Fig. 14 Image 21756. Contact print no.56 by Kees Molkenboer. Permission to reproduce image has been granted by © Kees Molkenboer / Nederlands Fotomuseum, Rotterdam.

[48] This particular set of photographs were chosen from the Nederlands Fotomuseum archive because they are exemplary of Molkenboer's working method in his other two thousand or more football contact prints. I chose football over other photojournalistic subjects (or the work of other famous Dutch photographers) since sports reliably offer dramatic situations and therefore clear 'decisive moments'.

A Rolleiflex TLR camera is used by holding it at chest level and looking down into the viewfinder mounted on top of the camera. Because the mirror reverses the viewfinder image from left to right, the photographer has to recalibrate his instinct to point the camera the wrong way. This is because when one moves the camera to the right or left, the subject appears to move in the viewfinder in the opposite direction. Molkenboer's 75mm f/3.5 camera lens required him to take a position as close to the action as possible. There was no zoom on the camera it only has the ability to adjust the focus and he was likely to have used the narrowest aperture to ensure everything in frame was sharp and giving him one less thing to think about. Molkenboer would need to frame his images with speed and adjust camera settings spontaneously to prevent blurring or incorrect exposure. Shutter speed and aperture is critical to catching motion, to capture an instant with minimal blur.[49] ISO speed is often high to allow faster shutter speeds. His twin lens reflex has two lenses - the one lens is the viewfinder and the bottom lens takes the picture. This design means there is a very slight offset between what the photographer frames through the viewfinder and what the camera photographs. For Kees Molkenboer, accounting for this parallax shift could arguably have made the difference between capturing and not capturing the fast-moving action of the game. It is precisely in these moments of re-calibration, in accounting for something, such as the limitations of the technology, where a certain embodied symbiosis starts to happen between the photographer and the camera, an extended cognition, a thinking that occurs *through* and *with* the apparatus. Using this camera, the body of the photographer is implicated in this way of seeing and composing. The camera is held at the chest, tilted slightly up towards the action. The photographer works by looking up to locate the action, then looks down to quickly frame it in the viewfinder, working to establishing a composition that is felt as much as seen.

[49] Nowadays sports photography is often done in shutter priority mode, although this requires software built into the camera. The Rolleiflex TLR of 1952 was purely mechanical.

Molkenboer's contact prints show a method of working that requires a highly concentrated level of decision-making, which is not only imposed by the speed of the football match, this acuity is enforced by the number of exposures he is afforded, the gauge of the film and the type of camera. In 35mm photography the photographer is only afforded 36 images per roll of film and then of course in digital photography there is the possibility of hundreds of images that could almost provide a continuous moment, closer to cinematography.[50] In many ways the basic functions of Molkenboer's Rolleiflex camera reinforces how decisive the decisive moment really is using this camera. The contact prints also show that in this split second, the photographer does not act alone, every decision is consensual with the apparatus; the restrictions of film, with the conventions of newspaper images and the expectations of readers.

5.4 The influence of publishing conventions on sport photography

There are over two thousand football contact prints sheets by Molkenboer in the Fotomuseum archive. Each show more or less the same formula for photographing the match. The photograph that depicts the moment of a goal is a confirmation that it did indeed happen, almost like the photo finish that determines what the naked eye cannot quite confirm or recover. A goal, a drive, a try, a stroke; all can flash before the eyes of a spectator without them truly comprehending the totality of what they saw.[51] Yet, in the moment of photographing a goal, the decisive moment is culturally anticipated by the visual culture of football and the newspaper format. Professional sports photography is a branch of photojournalism and its main application is for editorial purposes; for newspapers, major wire agencies or dedicated sports magazines. Sports photography is also

[50] In contrast to the basic functions of Molkenboer's Rollieflex camera, digital sports photographs are often taken in burst mode in order to capture the best moment or the best exposure, allowing the photographer to choose the decisive moment retrospectively.

[51] However, the referentiality of the image gets complicated: although it may show something that has truly happened (and appears visible), it does not display the true result of the competition.

used for advertising purposes both to build a brand as well as to promote a sport in a way that cannot be accomplished by editorial means. The particular style, narrative and brand associated with these outputs will influence Molkenboer's responses and decisions throughout the entire photographic process. For example, Molkenboer's medium format camera produces 6x6 square images, yet typically, only portrait and landscape images, determined by column sizes, were used in newspapers. Molkenboer prefers to work with this camera but knows that the images he frames will have to contain the action in either a parallel strip or vertical strip, but never horizontal from corner to corner. The conventions of editorial photography impose a way of seeing and subsequent framing of the game unfolding in front of him. In every single image, on every contact sheet it's possible to see this embedded bias transformed into a method of working. The technical system that this photographer is working within has recalibrated his vision and attention to conform with editorial printing conventions.

In one hundred and fifty years since the first halftone photographic image of a football match was printed in a newspaper in 1873 (Westby, 2018), a number of familiar tropes have emerged as a convention for describing certain match events. Bodies seemingly levitating in the air are one of the most persistent motifs in sports photography (Stauff, 2018; Moore and Lenman, 2005), as the leaps and jumps underline the potential of photography just as much as they do the ephemerality of the moment. These photographs have changed slightly with the advent of more sophisticated technology ie. burst mode and digital zoom, but largely they depict players receiving red cards, referees' decisions, goal action shots, penalty and free kicks, crowd reactions, goal celebrations, managers reactions, facial expressions, tackles and fights and recently, the referee viewing the VAR (video assistant referee) on the side line. These aesthetic conventions in news reportage photography require the use of technical codes through point-of-view shots. The contact sheet shows how Molkenboer tends to single out a highly rated player, creating an

individual 'hero' of a team. In commercial photography, the characterization of the 'hero' is formally built though what is generally known as the 'hero' shot. The hero shot is the best action photograph of a series which is chosen to represent the whole series. A typical hero shot in sports photography might depict a player when they decide to make a momentum changing shot for the game. Since its conception, football photography still follows gendered patterns of heroism by depicting testosterone-based behaviours that define the hero figure (Lines, 2001). Laura Mulvey (1975) argues that a male viewer can feel a kind of narcissistic pleasure from the identification with a human figure on the screen, usually that of the male characters, by imagining himself as the hero. As Judith Butler (1990) states gender is not an essential, biologically determined quality or an inherent identity, but is repeatedly performed, based on, and reinforced by, societal norms. This repeated performance of gender is also performative, that is, it creates the idea of gender itself, as well as the illusion of two natural, essential sexes, thereby creating the categories of women and men. Vicki Kirby (2011) argues that theories of cultural construction developed since the linguistic turn have inadvertently reproduced the very binaries they intended to question, such as those between male and female, nature and culture, matter and ideation, and fact and value. It is not difficult to trace the stylistic lineage and the gender binary of these hero action shots of sportsmen proliferating in the media. They bear a striking resemblance with Italian Renaissance painting; instantly recognisable for depictions of (male) heroic action, courage, strength and self-sacrifice also characterised by a dramatic composition, and a striking contrast between light and dark.[52] Here these photographs operate in two realms; as a metonym that stands for the teamwork, comradeship and solidarity but they also have a quality of their own which builds upon but also mirrors established pictorial conventions in western painting. This classic painting

[52] Photographers at the 2018 FIFA World Cup shared some of their photographs on *Accidental Renaissance*, a Reddit forum where users share everyday pictures that evoke the composition, lighting and other hallmarks of Renaissance artworks. https://www.reddit.com/r/AccidentalRenaissance/

composition and the 'hero' metanarrative is likely to have subconsciously influenced Molkenboer's distinctive aesthetic sensibility during the moment of capture. In this way the cycle is perpetuated as he mirrors and reproduces and the very binaries that influenced him. Such a practice "only displaces the same elsewhere" according to Haraway (1997, p.16).

Molkenboer tends to train one eye on a player for long periods of the match in anticipation of something special. These 'hero' photographs are highly emotive to the viewer because they shift attention to the perspective of the sportsperson which foregrounds the extreme physical demands of high-level sporting achievement and shows how technical the game is for the athlete. With his simple camera set up it can be seen how Molkenboer employs compositional techniques through his movement to create certain effects. In this way the context of an image can often be massaged by a useful angle to play with the subjective foibles of perceptions and memories.[53] The slight tilt of the camera from left to right serves to accentuate this physical effort, implying metaphorically an uphill struggle and, simultaneously, a sense of destabilised equilibrium and consciousness, reflective of a moment of deep concentration, when the athlete might be described as 'in the zone'. All these compositional devices should not be considered entirely accidental. Rather, they are reflective of a skilled practitioner, fully aware of not only how to capture a dramatic moment, but also how to facilitate through the use of the camera's specific interpretative possibilities, a constructed narrative for the image. In this way, the photograph potentially communicates much more than a straightforward account of a given match won by a particular player, it also elaborates the drama, emphasizing the effort and the significance of attainment. Although Molkenboer knows how to use the camera to elicit certain effects, with this set of skills he is still subservient to the dynamics of the game unfolding in front

[53] Such as the image of Diego Maradona facing down six Belgium defenders during the 1982 World Cup. This became an iconic photograph but is ultimately a famous manipulation, having been taken after a set-piece rather than in the middle of a dribble. (Gleeson, 2014)

of him and, will need to mirror the same tacit improvisatory procedures as the players of the game itself.

Fig. 15 Image 21768. Voetbal contact print no.56 by Kees Molkenboer. Permission to reproduce image has been granted by © Kees Molkenboer / Nederlands Fotomuseum, Rotterdam.

5.5 Cognitive circuitry - a shared theory of mind

Would a photographer who has never played football be able to capture the image of the match in the same way? Although the sports photographer will have digested the familiar archetypal newspaper photograph of a goal - which usually depicts a striker mid action shooting the ball, the ball in the air just beyond the goalie's reach - conceivably other experiences of playing ball as a child or falling pulls out a very precise understanding which draws on the generality of experience. Their experience would tell them they need to be

tracking the ball to capture the moment of the goal. Manifested in images will always be the phenomenological history of experiences, beliefs, desires and prejudices of the photographer. These past experiences are in constant dialogue with the present moment within which the individual is engaged. For Kees Molkenboer any prior experience of playing, watching or supporting football and indeed reading sports newspapers will come to bear upon the moment of pressing the shutter. This constitutes a complex web of knowledge and experience that helps to mentally map the relationships between not only the players but every tangible and intangible object in relation to one another. This factors the football pitch, the goal, eye contact with team players, gestures, gravity, speed, weight, angles, negative spaces, the rules of the game, he might also identify the particular style and tactics of known players, together with the conventions of sports reportage photography and so on. The only way for Molkenboer to make any prediction is to weigh up the entanglement and intra-actions of both human and non-human entities, rather than exclusively examining the inter-actions between humans. He will predict where to place himself for framing the optimum alignment of essential dynamics. It is here we witness a curious circuitry, a shared theory of mind between both the photographer and the goalkeeper. The athletic goalkeeper and the athletic photographer, both highly skilled and actively engaged, their concentration exists purely for the decisive moment. Just as the goalie knows he has to watch the ball to predict a goal, the photographer having mapped the striker and the goalie also watches the ball to predict the just-before-moment, in which he will need to depress the shutter to account for the millisecond lag of the camera.

In this moment the photographer and the footballer share a single distributed cognitive experience; alert, focussed and poised before action, and in direct correspondence to their changing environment. The instant being described here is one where the scene could fracture in any direction, the photographer is poised ready, already seeing the simultaneous

multiple potentials and ready to dash in any direction.[54] This element of 'the moment' is of hiatus and anticipation and not of conclusion, that which is just before a decision is made. Art historian Jean Clair (cited in Ward 2008, p.136), describes an aspect of the photographer's skill as being able to make intuited predictions "in a millisecond what is about to happen next." He can do this "because he remembers that he can predict." There is an element here, of the time being opportune yet pending, held in readiness, and thus the photographer who is all action is also poised before action.

5.6 Distributed Cognitive Systems

Certain posthuman theories that address non-human agencies have begun to force an awareness of the distribution of cognition and human action to the fore. As addressed in chapter one photographic theories have a tendency to centre their discussion around vision and the eye, yet in other discourses such as Gibson's ecological psychology (1976), and Bateson's ecology of mind (1972) the eye is just one component in a much larger system. In Gibson's (1976), *Ecological Approach to Visual Perception* the eye is understood as one component within broader processes of visual perception, which are themselves nested within a system of senses of which the kinaesthetic sense and touch are necessary parts. Together the senses form a sensory array. This array is predicated on motion and dynamic interaction with the environment. Hutchins takes this another step forward in his focus on cognitive ecosystems (Hutchins, 2010) which promotes the study of cognitive phenomena in context as part of dynamic patterns of inter-relation between elements organised as socio-technical systems (Hutchins 1995b). He advocates for a broader understanding of

[54] Libet et al. (1983) measured the time that subjects became consciously aware of the decision to move. Neuroscientists claim this activity in the brain is a premovement build-up of electrical potential called Readiness Potential (RP) observed from about 1–2 seconds prior to the onset of an action. Therefore, according to Libet (1983), our brain unconsciously plans our behaviour but allows for a conscious "veto" to alter the outcome of our volition. The findings of Libet (1983) have had an unrivalled influence on the prevailing view that both our conscious will and subsequent actions are caused by prior neural activity. This of course sets up a precarious deterministic causal assumption and does not factor in how our bodies and our environment are implicit in our decision-making process.

cognition that integrates perception and action, with the products of their interaction accumulating "not only in the brain but throughout the cognitive ecology" (Hutchins, 2010 p.712). According to Hutchins a cognitive ecology is the study of cognitive phenomena within social and natural contexts (ibid 2010, p.705). For example, many machines and animals, though not conscious, have some similar cognitive capacities to humans, and indeed all form cognitive systems in combination with each other, as part of the 'ecology'. Hutchins discussion of how a plane cockpit remembers its speed is revealing in this regard, literally taking memory outside of the head of single individuals and distributing its functions within the environment and particularly in relation to physical tools (Hutchins 1995b). Analysis of the nature of human cognition 'in the field' using a distributed cognitive framework have also been used to examine the navigation systems of naval vessels (Hutchins, 1995a), air-traffic control (Halverson, 1995), shared CAD systems (Rogers & Ellis, 1994), shared-database systems (Nardi & Miller, 1989), collaboration between programmers (Flor & Hutchins, 1992), and even a fishing community (Hazelhurst, 1994). More recently, Katherine Hayles (2017) extends the discussion of a human cognitive ecology by "opening it to comparison with other biological cognisers and to the cognitive capabilities of advanced technical systems" (p.11). Hayles covers theories and advances in neuroscience, cognitive biology, posthuman studies, robotics, AI and the digital humanities to re-equilibrate things and demonstrate the gradual deprivileging of the human in the wider cognitive equation.

Although there are a number of variations in the use of distributed cognition theory and its application in these areas; there are three main concerns addressed by most studies, these include: the reconsideration of the boundaries between the individual and the world; the analysis of the specific kinds of tools and artefacts which actually or potentially augment human cognition; and the impact of the distribution of cognition on the human mind.

Using Molkenboer's work as a case study allows us to apply these concerns from cognitive anthropology more specifically to the field of photographic practice in order to extend our understanding of the ways in which human and technical cognitions interact. As Hayles (2017) points out the cognitive capacities of human and technical have distinct differences. "On the technical side are speed, computational intensity and rapid processing; on the human side are emotion, an encompassing world horizon and empathic abilities to understand other minds (ibid p140).

The case studies given in this chapter offer a tangible way to understand the differing weights of human and technological cognitive capacities and their distribution in different moments during the event. We can begin to read the 'cognitive ecology' or meshwork by abandoning any *a priori* assumption about causal or agentive hierarchy of a photographer's brain/body/camera and similarly the question of where cognitive processes reside. Instead, we should start from a locationally uncommitted position. We should assume that every mental source needed to produce a photograph may well be extended and distributed across the neurons of the photographers brain, the muscles of the photographers body, the motions of the sense organs, the affordances of the camera settings and lenses, the material properties of the light sensitive emulsion, the photographers prior experience, the conventions of sports photography, and the general social context in which the activity occurs. These components can be broken down further, but none of them should determine the shape of activity in isolation.

As an example, Merleau-Ponty points out how the distribution of cognition through and with the environment guides a footballer's actions and behaviours. A footballer must consider the football pitch as an extension of the body in order to be guided by the lines and boundaries.

> For the player in action the football field is not an "object," [….]It is pervaded with lines of force (the "yard lines"; those which demarcate the "penalty area") and articulated in sectors (for example, the "openings" between the adversaries) which call for a certain mode of action and which initiate and guide the action as if the player were unaware of it. The field itself is not given to him, but present as the immanent term of his practical intentions; the player becomes one with it and feels the direction of the "goal," for example, just as immediately as the vertical and the horizontal planes of his own body. It would not be sufficient to say that consciousness inhabits this milieu. At this moment consciousness is nothing other than the dialectic of milieu and action. Each manoeuvre undertaken by the player modifies the character of the field and establishes in it new lines of force in which the action in turn unfolds and is accomplished, again altering the phenomenal field.
>
> (Merleau-Ponty, 1942, p.168-169).

In this passage, Merleau-Ponty observes that, to the player engaged in a game of football, the pitch is presented as a dynamic space that offers the player opportunities to perform various actions. For the player, the yard lines and those that mark out the penalty area are real boundaries that have significance for their behaviour. Extending Merleau-Ponty's idea further, the yard lines also help the photojournalist to predict the actions of the footballers, plus they indicate where he might stand to optimise his point of view, since he would not run between two ends of the pitch. Both footballer and photographer are interconnected through a shared understanding of the rules of football, and their immediate environment perceived as the background to action. When Merleau-Ponty writes about "consciousness is nothing other than the dialectic of milieu and action" (1942 p.169) he is referring to the way in which there is an intimate correspondence between the behaviour, and the subject's environment perceived as 'moments of a unique totality'.

As we see, only in degrees of scale and resource is there a significant difference between the high-tech coverage of the marathon and the lone photographer. In both, cognition is embodied (although possibly more mediated in the case of the helicopter cinematographer) and situated, which means that thought and action are dynamically coordinated through interaction with the environment. This ability is leveraged when humans restructure their

environment or adjust their approach to optimise cognition. The act of photographing is a process of moving, seeing and thinking; an interplay between intention and discovery that evolves as each subject is negotiated. As the world is movement so too must the body and the aims of the photographer be modified to account for this movement. This humbler perception of the photographer's role in simple photographic systems help us to see the extent of how entangled we are. And as we move to a more technically complex future, we decide to what extent technical autonomy should and will become increasingly intrinsic to human complex systems.

5.7 Conclusion

An analysis of photography using a distributed cognition framework allows us to consider all of the factors relevant to the task, bringing together the people, the problems, the tools used, and the context into a single unit of analysis. This makes it a suitable model for developing an understanding of how mental activity is externalised into the world, as photographers support their own activity in the dynamically evolving and collaborative processes of work activities.

In this chapter it is shown, through two different examples, how the practice of photography extends the human through a complex network of apparatus and any decisive moment is distributed across the *dispositif*. Where the photographer's cognitive resources are shared, this movement of agency and decision making is distributed amongst all the actors of the meshwork in differing measures. This shifts the proportionality of decision making and this allows them to accomplish something that an individual would not achieve alone.

Furthermore, if we take the view that human cognition is distributed through a meshwork that includes the agencies of technology, institutions and culture, we come to realise that

the photograph is not an outcome, nor is it an instant or individually authored action but rather a momentary arrest of many animate meshworks in action. And whilst every decision is technologically modified; mediated by a technologically extended mode of seeing which collapses space and time into a new mode of perceiving the world, and this mode of seeing is all part of a contingent system.

The next chapter will discuss how some professional photographers choose which functions to assign to the pre-set programs of the camera, in this way, they decide to give cognitive capacity and agency to the camera apparatus. Introducing discussions from Vilém Flusser shows how the photographic apparatus operates in ways that are not immediately known or shaped by its operator. On the other hand, some artists have consciously chosen to delegate agency to the camera as a creative strategy to expose or play against the apparatus. The implications for this type of collaboration will be elaborated upon using a contact sheet from the archive of John Hilliard.

Chapter Six: Photographer Collaborates with Camera Apparatus

> I do not have free will; I am not a functionary of programs that are alien to me; I am an instrument. Not being free I do not surprise. I am predictable. History (as a flux of surprising and unpredictable happenings) has been overcome. I function within a post-industrial situation, a messianic situation, I am in paradise.
>
> The lack of surprise, the lack of an unprogrammed future is unbearable. Paradise is unbearable. It bores and nauseates me. I must rebel. Can I rebel? I believe I can. The sensation of boredom and nausea that the programs cause in me are experiential proof that I am not completely programmed.
>
> –Vilém Flusser (1966), On Program in O Diário newspaper, Sào Paulo.

The history of photography can also be a history of automation. New modes of decentralised image production did not come out of nowhere but are at least one hundred years in the making. Modern visual culture, which is computational and network-based in nature, has its roots in the very essence of chemical photography. As Vilém Flusser, 2000 states "the character of the apparatus can be discovered through an analysis of the simple camera, as if in an embryonic state" (p.21).

In *The Gesture of Photographing* (1991), Vilém Flusser describes how the photographic apparatus presents two possibilities in one single gesture, "it allows the world to 'inscribe' itself on a surface; at the same time, it imposes 'rules' on how this can be done" (Flusser, 2011). Flusser envisioned the future as a hopeless society because of the process of digitalisation of human memory, body and even the self, brought about by the ceaseless development of future automata. His fear was that the technologisation of human beings would eventually lead to their lack of autonomy, making them absent proxies. Therefore, a philosophy of agency should be established to deter-mine the extent to which human

beings are free to generate novelty and be masters of their own fate in a posthuman environment.

This chapter expands some of the discussion in the previous two chapters that describe how, when the professional photographer chooses which functions to assign to the camera, for instance; optical zoom, burst mode or shutter-priority mode, they delegate not only function but cognitive capacity to the camera. Whilst this movement of agency and decision making, where the photographer's cognitive resources are shared, would allow him/her to accomplish a task that an individual agent could not achieve alone, it also permits the camera to co-create its own mode of seeing. To understand the extent of this problem a closer examination of the black-boxed complexity of interactions that make the photographic event possible is helpful. More than just the mechanical components of the camera, we must focus on the ethic inspired by the apparatus which produces technical images, that is, images created by an apparatus which by necessity diminishes human input. In short: we use the camera, but the camera uses us as well (Rosa, 2016).

The first section of this chapter examines the fundamental procedures that underpin the photographic image by using particular artworks by conceptual photographer John Hilliard that arguably reflect upon photography's own condition. Hilliard's work prompts questions about how reality is depicted according to the camera's predetermined technical programs. These questions are extended through the work of Flusser who came to question creative autonomy and freedom in a programmed world – as camera technology increasingly moves further towards automation, helping to fuel debates about technological determinism, this becomes a pressing issue to unravel.

The chapter will consider a contact sheet of Hilliard's work before the discussion turns away from human-technological relations that tend to exclusively focus on its social effects.

The discovery of the contact sheet reveals dimensions to Hillard's engagement with the work but also introduces a discussion of environmental-technological relations that have been excluded in philosophies of technology but also extends Flusser's philosophy of photography. These perspectives tend to privilege the apparatus and the auteur's mastery of it at the expense of a complex network of other causes from which the image emerges. The actual practice involved in Hilliard's work builds a bridge to an analysis of the photographic apparatus and posthumanist and new materialist discourse. This helps to expose some of the implications involved when the human aspects of the network are outsourced and become closer to the apparatus. The argument is assisted here by Vilém Flusser who developed a lexicon of terms that continue to be useful for thinking about contemporary photography, digital imaging technologies and their uses.

6.1 Is there an essential quality or intrinsic characteristic of any medium?

Some photographers have asked if there is a condition of the camera that belongs only to the camera. This question was elegantly posed by conceptual photographer John Hilliard who similarly attempted to record and reflect upon photography's own condition by means of foregrounding its apparatus. He explicitly deployed this question as a creative strategy to produce an artwork entitled *Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors)*, 1971. The artwork sets out to identify the problem– What are the fundamental procedures that underpin the photographic image? *Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors* comprises a gridded display of seventy photographs, arrayed in ten rows of seven across, taken by a camera aimed at a mirror, showing itself at the moment of exposure. As the second part of the title of the work indicates, the images, which move from pure white to pure black, are the result of all the possible combinations of aperture size and shutter speed in Hilliard's camera, a 35mm SLR East German made Praktica. In the grid, the artist has positioned the optimal 'correct' exposures in a diagonal line from the top

right to bottom left. The camera has become both the subject and object of the work in that the seventy photographs show the images resulting from all the apparent variables governing its making. This is the famous deadpan non-aesthetic of conceptual photography, in which the individual creative agency of the photographer is purposely downplayed: here, the camera is simply 'recording', as if it has an agency of its own (Palmer 2013).

Fig. 16 John Hilliard, *Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors),* 1971. Permission to reproduce image has been granted by John Hilliard

The work is clearly intended as a commentary on the camera's supposed access to an objective depiction of the world. It contemplates the camera itself as a mechanical device, subjecting a repeated image to a predetermined and technically dictated set of conditions, demonstrating in serial form the controls operating in 'basic' photography, before any aesthetic intervention has taken place.[55] By exploring one set of parameters and rigidly following the outcome it appears Hilliard intended this work as the ultimate self-reflexive, reductive gesture. The imagery in each photograph directly reflects and reports on the technical or chemical conditions which caused the final photographs to appear as they do, (e.g. light readings, shutter speeds, printing). Although photography is both the medium and the subject of Hilliard's work, he shows that photographs do not give a picture of 'reality', but different versions of reality. In fact, it could be said that the camera's condition is only meaningful to the camera because only the middle diagonal of clearly exposed images are legible to the human. In revealing the processes that cause a photograph to appear as it does, Hilliard's work prompts questions about how reality is depicted according to the camera's predetermined technical programs, precisely the same questions which Vilém Flusser analyses in *Towards a Philosophy of Photography* (1983).[56]

6.2 The decisive moment as a series of quantum decisions

Flusser (2000) speaks at length about the 'apparatus' of the camera as being a tool that has its own 'program' that takes precedence over human control.[57] The assertion is that

[55] Notably, Hilliard's work does not consider focus as one of these 'conditions', nor does it consider film stock or the passage from the negative to the print. We simply assume that Hilliard's photographs are all printed in the same way.

[56] The English translation of this book wasn't published until 2000.

[57] Flusser (2000; 2013; 2012 pp.195-201) developed a lexicon of terms that continue to be useful for thinking about contemporary photography, digital imaging technologies and their online uses. These include: the 'apparatus' (a tool that changes the meaning of the world in contrast to what he calls mechanical tools that work to change the world itself); the 'functionary' (the photographer or operator of the camera who is bound by the rules it sets); the 'programme' (a 'system in which chance becomes necessity' and a game 'in which every virtuality, even the least probable, will be realised of necessity if the game is played for a sufficiently long time'); the 'technical image' (the first example of which is the

apparatus codify the world through their programmed reality.[58] At a very basic level, each material or piece of equipment in the photographic process has its own set of ideologies and conditions built into it – what Flusser terms generally as 'programs'. These programs embody a particular ideology which insists on a particular point of view, for example, cameras are designed with pre-set modes, lenses with set focussing and aperture sizes, enlargers with particular sizing limitations, film with a particular gauge, speed and number of possible exposures, film emulsion with a particular colour, tone, grain and light sensitivity. Flusser (2000) describes how photographers are playing a game of operating the camera, but always within the programmed rules of the apparatus. He writes:

> In choosing their categories, photographers may think they are bringing their own aesthetic, epistemological or political criteria to bear. They may set out to take artistic, scientific or political images for which the camera is only a means to an end. But what appear to be their criteria for going beyond the camera nevertheless remain subordinate to the camera's program. In order to be able to choose camera-categories, as they are programmed on the camera's exterior, photographers have to 'set' the camera, and that is a technical act, more precisely a conceptual act. In order to be able to set the camera for artistic, scientific and political images, photographers have to have some concepts of art, science and politics; How else are they supposed to be able to translate them into an image? There is no such thing as naive, non-conceptual photography. A photograph is an image of concepts. In this sense, all photographers' criteria are contained within the camera's program. (p.36)

Where Flusser's theory and Hilliard's artwork mesh is in the view that a photographer's practice is fixed to a program. "Photographers can only act within the program of the camera, even when they think they are acting in opposition to this program" (ibid). Flusser (2000) considers pressing the shutter release, the apparent final decision made by the photographer, as only the last of a series of part decisions resembling grains of sand. "[…]

photograph, with its particular kind of significant surface that looks like a traditional image but harbours encoded and obscure concepts that cannot be immediately deciphered).

[58] Flusser uses photobooths as an example of an automated apparatus that constitutes a mosaic of pre-programmed acts which produce programmed photographs: programmed format, colour, background and lighting. These are technical images whose messages are aimed at the apparatus and not at the one portrayed. (2013, p116-117)

no decision is really 'decisive', but part of a series of clear and distinct quantum-decisions, likewise only a series of photographs can testify to the photographer's intention. For no single photograph is actually decisive; even the 'final decision' finds itself reduced to a grain in the photograph" (p.39). Flusser's insights call into question the auteurship of Cartier-Bresson's Decisive Moment, where the camera is conceptualised as an uncomplicated extension of the photographer's body, one that is simply a neutral relay of instinctive wishes and desires.

6.3 Freedom in a programmed world

When Flusser writes *Towards a Philosophy of Photography* in the early 1980s, he can look back at nearly 150 years of a relatively stable camera technology. However, as the ontological basis of photography starts to change in the transition between analogue and digital in the 1990's Flusser becomes increasingly dystopian as he develops his philosophy of apparatus. Cameras had now become small computers which prompted him to question how the apparatus as an opaque container render us passive as we become unwitting players in our engagement with prescribed ideologies, pre-determined conventions and orthodoxies. Digital photography - sometimes referred to as computational photography because of the digital processing of image data inside the camera – saw a transition from post-production options towards automated image processing during the actual shooting. With this automation also came a transfer from decisions made by humans to decisions made by the camera itself. Engineers working on computational photography had developed a canon of applications that chased the goal of image improvement through algorithmic calculation where all of the techniques rely on laws of averaging. For example, to fix noise, the software measures the statistical properties of images and creates an algorithm that determines what is or is not 'noise' in any given photograph (Rosa, 2016) or High Dynamic Range (HDR) algorithms that overcome limitations in reproducible contrast by combining

several exposures with varying stops or Panorama stitching overcomes limitations of the camera's field of view by combining shots made in different directions (Hayes 2008). As Flusser points out "the possibilities contained within the camera are practically inexhaustible. One cannot photograph everything that can be photographed. The imagination of the camera is greater than that of every single photographer and that of all photographers put together" (2000, p.36). As cameras have become increasingly complex, labyrinthine systems, photographers wittingly and unwittingly have consigned more and more agency to the camera and its pre-set programs. Flusser describes "a technology capable of reaching into an incomprehensible, meaningless chaos of whirling particles—whether molecules of silver nitrate or magnetic charges that translate into pixels – and ordering them into a meaningful mosaic, all made possible by an apparatus with control keys" (ibid). Although he uses the language of particle physics here, which suggests he is fully aware of the entangled mesh of agencies at play in the photographic process, Flusser seems preoccupied with his fear of the capacity of the medium to function independently, to become automatic.

Flusser's foreshadowing of posthumanism is clear when he asks what he sees as the essential question: "Is there any room left for freedom in a programmed world?" (Novaes, 2013 p.XII). He has a fear of the lack of free agency in a society that he calls *telematic*, where apparatuses ultimately overrule humans. Apparatuses are seen here as "black boxes", tools which conceal information behind an opaque surface, and whose behaviour consists of reproducing and mechanising human thinking. In this view, humans are generally functionaries of apparatuses, because their agency depends on these undecipherable instruments, developed autonomously outside humans' will (Flusser, 2000, pp.73, 82).

In discussion with Magnum documentary photographer David Hurn, (see appendix for transcription) he describes how he never got what he wanted using burst mode on his

Leica film camera. The camera either responded too early or late and so missed the moment entirely. He thinks that this was also the case for all the Magnum photographers he worked with. He preferred to rely on his own intuition to predict the behaviours of the things happening in front of the camera, since cameras do not have this experience of being in a lifeworld to make these intuitions and predictions. In this way, Hurn has understood where his cognitive capabilities of "emotion, an encompassing world horizon and empathic abilities to understand other minds" are superior to that of the lightening responses, calculations and predictions of machines (Hayles, 2017, p.140). In order to achieve what he wanted he had to recover agency from the camera's automated functions.

Foreseeing the coming technological implementation of a *telematic* culture Flusser suggests that our times may be characterised by the term "program," much in the same way that the seventeenth century is loosely characterized by the term "nature," the eighteenth by "reason," and the nineteenth by "progress." (Novaes, 2013 p.XII) In suggesting this shift in worldview, he then poses a provocative question: If I function within a predictable programmed reality, can I rebel and how can I do it? Flusser wants to know to what extent can we fight scientific determinism on the grounds of human agency. He eventually concludes that only malfunctioning programs and apparatus allow for freedom and the essence of freedom is unpredictability. In other words, in error, accident, and breakdown, a liberation and transcendence from predictable programmed reality is not only made possible, but also increasingly becomes the precondition for any future theory of political resistance. Malfunctioning and unpredictability are important points expand here for two reasons. Firstly, in the moment that something breaks down or malfunctions the 'object' in question (in this case the camera) loses its objecthood and becomes a series of parts, materials, programs, processes and relations – in other words, it shows its 'thingness'. Secondly, the composition of its 'thingness' shows that objects are not entities with their own condition, with fixed properties and boundaries, but are enmeshed in multiple other

systems at a micro and macro scale. As Heidegger (1962) states a tool exists as an "in-order-to" (to do something) and for this reason, they always exist in a network of other tools and organisations. Bill Brown's essay *Thing Theory* (2001) posits that an object becomes a thing when it can no longer serve its common function. When an object malfunctions or is misused, it sheds its socially encoded value and becomes present to us in new ways through the suspension of habit. This renewed perception of 'objects' can be viewed as a result of what happens when a meshwork is broken - the meshwork that the object relates to is reorganised and exposes an otherwise hidden material meshwork that constitutes the 'thingness' of the photographic apparatus.

Here then is the necessity of experimental artists to disassemble automated systems and recover some semblance of agency within apparatuses. As Flusser states:

> "they [experimental photographers] are conscious that *image, apparatus, program* and *information* are the basic problems that they have to come to terms with. They are in fact consciously attempting to create unpredictable information to release themselves from the camera, and to place within the image something that is not in its program. They know they are playing against the camera" (2000, p.81).

Exemplary of this approach, when the components of the technical apparatus were still mostly materially accessible, is the experimental Structural/ Materialist film movement in the 1960-1970's who made self-reflexive artworks that attempted to record and reflect upon the mediums own condition by means of foregrounding materialism and material function. They attempted to be non-illusionist by using filmic devices such as repetition, double exposure, abstraction, increased film grain and deploying camera-less techniques that resulted in the demystification of the film process. By rupturing the illusion what these avant-garde films drew attention to are some of the specific meshwork of relations between

the photographer, the film materials and the camera apparatus that co-produce the film image. In this way these filmmakers revealed some of the properties of film as material in order to expose and challenge mechanisms of identification and representation and the ideological apparatus behind commercial cinema.[59]

However, as our artistic tools of engagement have become digitalised very few artists have the skillset to interrogate their materials (now data), tools of engagement, the processes of production and their subsequent power relations. As Latour (1999) states to unpack such a black box is to unpack the internal complexity of technical processes that are made opaque by their own success. These are the invisible workers that build components; and the otherwise black-boxed complexity of interactions that make the photographic event (and the illusion) possible.

Artist Harun Farocki was one of the first to notice a new visual regime inaugurated by image-making machines and algorithms which he termed the advent of 'operational images'. Farocki's work is deeply influenced by Flusser's concept of the technical image.[60] In the twenty years since artist Harun Farocki made works such as *Eye/Machine* I, II and III (2000-2003) which examined the operational potential of images in fields from marketing to warfare, we have become more aware of how images are at once becoming more powerful, and the means through which they're produced have become ever darker and

[59] In dominant cinema, a film sets up characters (however superficially deep their melodramas) and through identification and various reversals, climaxes, complications (usually in the same order) one aligns oneself unconsciously with one or more characters. These internal connections between viewer and viewed are based on systems of identification which demand primarily a passive audience, a passive viewer, one who is involved in the meaning and swept along through persuasive emotive devices employed by the film director. According to Gidal, this system of cinematic functioning categorically rules out any dialectic and functions to maintain the ideological class war and its invisibility, the state apparatus in all its fields (1976 p.4).

[60] For Flusser, technical images are meaningful surfaces 'created by programs, they are dependent on the laws of technology and the natural sciences'. They are now constructed inside computers, rather than through photographic chemical processes.

hidden. In his article *Invisible Images (Your Pictures Are Looking at You),* (2016) written for The New Enquiry, Paglen points out the extent to which the function of images has changed from representation and mediation to activations, operations, and enforcement. They no longer simply represent things, but actively intervene in everyday life. Operative images are utility images – working images that typically serve practical purposes tied to specialised tasks. Building on Farocki's work, Volker Pantenburg (2017) distinguishes between three senses of 'operationality': images serve as elements of purely automatic processes, as interfaces to operate machines and as triggers of human action. Also referring to Farocki's work, Thomas Elsaesser (2014) goes further by characterising operative images as "instructions for action" – and not only that the instructive function seems to have become "the new default value of all image-making" (n.p.). As Paglen (2014) states "We're quickly approaching (and have in fact probably long past) a moment where most of the images in the world are descendants of the operational images, namely images made by machines for other machines" (n.p). And when this happens the image is no longer necessarily visual; "machines rarely even bother making the meat-eye (human eye) interpretable versions of their operational images. There is really no point. Meat-eyes are far too inefficient to see what's going on anyway" (ibid). The novelty of operative images is that they require neither human creators nor human spectators. The surpassing of human vision marks a moment of convergence: whatever a sensor captures can participate in the data image that is used to identify, predict, and pre-empt. As Katherine Hayles (2017) describes in her analysis of financial trading systems, another issue is the vast difference between the speeds at which technical cognisers operate at high frequency versus the cognitive timelines of humans in the assemblage. Combined with faster processor speeds, vast increases in computer memory, and fiber optic cables through which information travels at near-light speeds, has introduced a temporal gap between human and technical cognition that creates a realm of autonomy for technical agency (p.142).

The challenge now facing artists is how to pick up where Farocki left off and to find ways to visualise to human eyes how a machine is seeing. How might an artist or 'envisioner' recover any semblance of agency within a closed system where algorithms draw inferences, analyse contexts and make decisions within milliseconds? In order to outwit the "stupidity of the apparatus" and produce something unexpected and informative instead of redundant, as Flusser suggests, we first need to locate the mechanisms and material processes that construct images and the materiality of images themselves. Flusser, Farocki and Paglen - in different decades in the ontological transition from analogue to operational images – independently make urgent calls to address the extent of the entanglement of decision making between humans and machines before we plunge even further into the darkness of a world whose images remain invisible yet control us in ever-more profound ways.

Recognising the role played by nonconscious cognitions in human/ technical hybrids and conceptualising them as cognitive assemblages is a necessary component but of course is not a complete answer to the problem. What these human/technical accounts exclude from their discussion is the dynamism and characteristics of matter, that which also constitutes the very basis of photography but also the environmental conditions on which it relies. As Barad discovers in her theory of agential realism, which draws on the quantum physics of Niels Bohr and his careful analysis of measurement in science (a practice that we can compare to that of photography) his instruments and the subjects of his research are entities that constitute each other. In Barad's terminology they do not interact as self-sufficient entities, they intra-act and thereby (re)define each other. And even if we have arrived at a point where human cognition interrelates only on the periphery and there is complete technical autonomy between machines, should we still assume this is a stable system? This raises theoretical questions such as: What are the general structures of the causal networks that give rise to operational images? Who or what is operating?

A relational account is all the more necessary as the practice of photography becomes increasingly more automated causing a decentering of the human. As we are beginning to see, insights from posthumanism and new materialism, which give philosophical expression to the vitality, wilfulness, and resistance possessed by nonhuman entities and forces, offer an added dimension to Hayles human/technical cognitive assemblages. This balance will be addressed through a return to Hillard's work which reveals the way the animism of matter has been concealed as a hidden participant in photographic discourse.

Fig. 17 John Hilliard, *Sixty Seconds of Light* 1970 © John Hilliard. Twelve black and white photographs, each 15x19 inches. Permission to reproduce image has been granted by John Hilliard.

Hilliard's first exercise in pure photography, and one which can be directly related to *Camera Recording its own Condition,* (1971) is *Sixty Seconds of Light*, (1970). This work demonstrates the way a photograph changes when the film is subjected to different time exposures, using as a model twelve images of the same darkroom clock, set at twelve increasing exposure times (from five seconds to one minute). In discussion with Hilliard he explained the process by which the work was made.[61] The idea for the work required just one entire roll of film, a

[61] In my search for contact sheets from analogue photography I reconnected with John Hilliard who was one of my tutors at the Slade School of Fine Art between 2001-2003. Hilliard gave me access to his personal archive where we found the contact sheet he made for *Sixty Seconds of Light* in 1970 (Fig. 18)

6x6 medium format camera, a timer and cable release - needed because of slow exposures, and overhead room lighting. The work was executed almost scientifically, seemingly locking down all possible variables, similar to automated, computational photography in industrial operations.

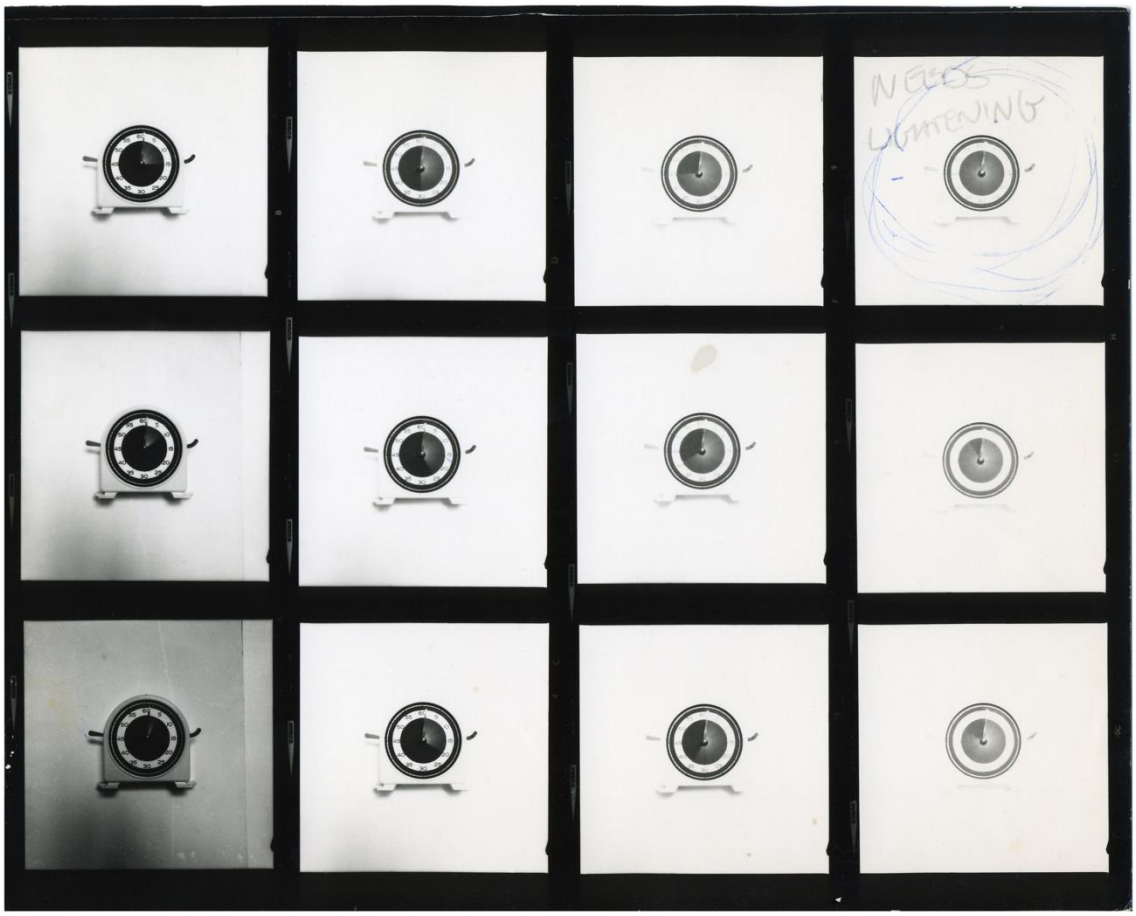

Fig. 18 John Hilliard. Contact sheet made for *Sixty Seconds of Light*, (1970). Permission to reproduce image has been granted by John Hilliard

However, what the contact sheet suggests is that photography's 'own condition' is not as easy to reduce or define as it may seem. On examining the contact sheet for this work, the final exposure at 60 seconds shows Hilliard's inscription "needs lightening". His inscription indicates that even when all the variables are locked down in a tightly choreographed image production, contingency still breaks through. Hilliard thinks "perhaps a fluctuation in the power supply in the sixty second image caused the image to be underexposed". By exposing some of the functions of the camera he inadvertently exposes some of the agency

and animism of other determinates that interact with his and the camera's intention. What these experiments suggest is that the camera does not have its own condition because Hilliard has had to make interventions to overcome this interference. Of course, the final image is doctored using a simple darkroom technique called dodging to bring the exposure in line with the intention for this work and for exhibition.

Inadvertently, Hilliard's contact sheet explicates a common feature of computational photography- the algorithmic calculation which use the laws of averaging. Photochemical images and computational photography both require an active interpretation of raw data to be 'useful', as Barad has described it in regard to the measuring practices in Bohr's experiments. What is now commonplace in computational photography is the degree of automation in this interpretative step that requires the image capture device to collect much more intermediary information. Hilliard's contact sheet shows a manual version of a programme called autobracketing - a standard feature of all modern cameras and capture devices where the camera will take several successive shots (often three) with slightly different exposure settings. In computational photography the images may be automatically combined, for example into one high dynamic range image, or they may be stored separately so the best-looking pictures can be selected later. In his tightly choreographed image production, Hilliard has assumed a fixed and stable hierarchy of agencies in the photographic process. He doesn't account for the way the photographic apparatus is at the mercy of other agential matter that sit within other systems that have their own set of variable conditions - those such as electricity, photons and electromagnetic waves whose wildness and animism have been tamed for domestic order (Gooday, 2008). Jane Bennett's (2010) actor-network analysis of the Northeastern blackout of the electrical power grid describes the chaotic behaviour of electrical flows in complex grids. Bennet discusses the issue of responsibility in these assemblages, suggesting that humans should not be regarded as privileged by their capacity for action separately from the order of material nature (ibid).

This points back to what she calls 'thing-power', the "so-called inanimate things have a life of their own, that deep within them is an inexplicable vitality or energy, a moment of independence from and resistance to us and to other things. (Bennett 2004, p.358). Although light itself may well be eternal, its handling is historical and is even more tightly corseted in the internal reflections of fibre optic waveguides, the medium of twenty-first century telecommunications and network media. As Stephen Jones (cited in Cubitt et al. 2015) points out, "digital light is an oxymoron: light is photons, particulate and discrete, and therefore always digital. But photons are also waveforms, subject to manipulation in a myriad of ways. From Fourier transforms to chip design, colour management to the translation of vector graphics into arithmetic displays, light is constantly disciplined to human purposes" (p.9) Likewise, digital technologies are not immune to the effects created by light. For instance, one of the major challenging technology issues in machine vision technology is caused by the reflections of light (Carroll, 2020) Light reflections on shiny, reflective or glossy objects are seen by the robot's vision system as 'features' (i.e. things that should be detected) but they aren't real physical features, so they confuse the whole detection process. Even as photography's identity is challenged by computationally synthesised images, images made with energy other than light, or the apparent absence of human engagement, 'thing power' still finds ways to trouble will, intention and agency and produces reality itself.

As Hilliard attempts to find the essential qualities of the medium in a very measured way, the contact sheet shows something in complete opposition to his intention. It demonstrates at the molecular level, that the actions of matter are essential to the creative process but are also capable of outsmarting the human/technological cognitive assemblage in unpredictable ways. The contact sheet shows there is no essential way of being for the photographic apparatus since apparatus do not exist in a vacuum. Hilliard was trying to divorce the apparatus from the living world that supports it. In making his corrections of

the image he overrides any trace of light as a living thing. But as these 'intra-actions' show, when the camera apparatus takes a picture of the world it is not just recording the conditions of the camera but also the conditions of the world that are enacted through the camera. Following on from both Hilliard's and Farocki's work, if machine vision systems were to record their own condition, even though its conditions might be meaningful for us, they would only be legible to the machine anyway.

Viewing Hilliard's contact sheet today, with the knowledge of the increasingly sophisticated automation of cameras that was about to occur, starting with basic electronic controls in the 1970s and massively expanded with digital cameras since the 1990s, his work can be interpreted afresh. Although this work appears as a homage to the economic simplicity of the camera's 'condition' in the classic age of analogue photography, in many ways it remains a durable definition of computational photography today. The activity of taking photographs–of using a camera—is at once both simpler and more complex than the conditions depicted in Hilliard's work but there remains a continuity in the essential relational ontology between the camera apparatus and human intention as inseparable from the living world. We are reminded of another dynamic. As Manuel De Landa describes the power of nonhuman materiality to "self-organise […] inorganic matter is much more variable and creative than we ever imagined" (2000, p.16). The fluctuation in electricity is an expression of how things are never things in themselves as constants, they are always being affected by other things. The apparatus cannot exist without the agencies or the variables Hilliard is trying to write out. Although we might design adaptive systems that predict based on modelled behaviours of past events or write linear differential equations that describe closed equilibrium systems, in nature, nonhuman forces derive from systems that sit within infinite systems which are constantly self-organising themselves, for themselves. In these far-from-equilibrium systems (Parisi, 2019) there is no such thing as stable, optimum and predictable. The apparatus can therefore never speak for itself. If we

can no longer have access to the invisible workers behind the image-making apparatus and yet we know the creative power of nonhuman materiality to 'self-organise' against human or technological intention perhaps this answers Flusser's call to 'outwit' the apparatus in the name of freedom. The vitality of matter may in fact be the last bastion defending us from an entirely programmed and predictable future, saving us, as Flusser laments, from the "sensation of boredom and nausea" of an unbearable paradise.

6.4 Conclusion

The story behind Hilliard's work in many ways is a distilled allegory for the thesis' central claim which brings matter, energies and contexts into discussion with human intention and the photographic apparatus. Although this chapter attempts, through Hilliard's work, to understand some of the general structures of the causal networks that give rise to operational images, inadvertently his work shows up the difficulty of this task primarily as a result of the shift from analogue mechanical components to the black boxed hardware and programmed software of digital apparatus. The materials of engagement, the processes of production and their subsequent power relations hidden by the black-boxed complexity of digital interactions that make the photographic event possible now generate data in closed systems that are illegible to human eyes. Additionally, as machines have become increasingly smart and have entangled human thinking to artificial intelligences, it seems no longer possible to fully distinguish amongst levels of decision-making that occur in the newly formed space between critical reasoning, logical inference, and sheer calculation. It is difficult to pinpoint who or what is operating in these systems. As Hayles (2017) states "for the cultural critic, knowing precisely how the informational exchange operate within a cognitive assemblage is a crucial starting point from which to launch analyses and arguments for modifications and transformations, deployments or abstentions […]" For the experimental artist or designer, breaking down how informational exchanges operate in

the particularity of its material event is a crucial method towards questioning its uses and re-appropriating the processes elsewhere.

Despite its simplicity Hilliard's work with photo-chemical photography allows us to think differently about algorithmic photography and its conditions and distributed agencies through its failure to account for other agential matter and systems, intra-actions and power imbalances. The most challenging technology issues in machine vision system today is lighting and contrast where a small change in conditions can create a huge change in performance. Machine vision is a very black-and-white function, there is no intuition or anticipation like human perceptual systems. Either parameters are good, or they are not. While machine vision can pick up things that humans will not because they can look at everything at once, that advantage is diminished greatly by the limitations on programming for responses to the unpredictability of matter and processes. The world of human and nonhuman displays different kinds of textures, behaviours, forces, agencies and criticality thresholds which might be difficult or impossible to predict. These complex, self-organising, non-linear and vital forces that lead to novel and unexpected results are the very things that human/technical assemblages forbid. This contradiction indicates that the preference for one kind of force over another is an ideological choice, non an empirical conclusion. More accurate and encompassing views of how our cognitions enmesh with technical systems and those of other life-forms will enable better designs, humbler perceptions of human roles in cognitive assemblages, and more life-affirming practices as we move toward a future in which we collectively decide to what extent technical autonomy should and will become increasingly intrinsic to human complex systems.

Conclusion

It was intended that this thesis would also contribute to a rapidly growing line of inquiry - the anthropology of technology (or digital anthropology), which examines the issues inherent in the relations and interactions between individuals and technologies as they form increasingly complex systems and networks. Although some very recent literature from media theory deals with some of the implications of the gradual displacement of the human subject it still has a tendency to talk about media in terms of the social-cultural implications for the human. Yet if human eyes are no longer looking at the majority of images, I needed to source other perspectives that introduce environmental-technological relations, discussions that have been excluded by Flusser, media studies and in philosophies of science and technology. These address how the agency of environmental systems and the vital behaviours of materials and matter have implications for the machine as the viewing subject. Added to this problem, the vast majority of images now are operational - used to determine the functioning of a phenomenon to predict its future behaviour, either in empirical cause-effect manners or probabilistic terms. The role of apparatuses is to produce new information with the goal of achieving a decisive overview of a specific system. However, two of the most current difficulties facing science and technology studies are from cognitive science, with the concept of free will in deterministic terms. The other is quantum physics, with the theory of the observer effect. New material feminism perspectives along with a diffractive methodology were introduced to undo the binary separation of knowing and being. These also trouble concepts of will, intention and agency, recognising them not as individual possessions, nor as manifestations of the negotiated pull of structure and agency as in social constructionism, but as force, flow, affect and intensity distributed across a multiplicity of different human-nonhuman modalities. Where my thesis differs from some of the secondary sources available at the time of writing, is that it builds a triadic relational framework that includes the agential interactions between non-human,

humans and technologies in an emergent, contingent and dynamic practice of materialisation in which it is understood that each component acts on its own terms. It was therefore necessary for this thesis to use a transdisciplinary approach marshalling fresh insights from cognitive science, cognitive anthropology, new materialism and posthumanism to expand an understanding of human cognition (as entirely distributed), move beyond human-technological perspectives and to acknowledge the broader range of agencies that are operating beyond the intentions of the human.

This thesis began with the idea that there was some aspect of the work of the photographer that has been elided in the way that photography has been most frequently discussed in the literature. On reflection, this thought was triggered by the instance of digital photography as an interloper and usurper that first masqueraded as the same kind of representational apparatus as film photography and then began to displace its film precedent by becoming the 'photographic norm'. In the process, it has both more fully engaged and displaced the human. Paradoxically, this divergence and separation stimulated attention to the collaborative network that the photographer is part of. In brief, the thesis sets out to test how a meshwork model of collaboration between photographer, world and apparatus might be sustained. The purpose of this was to resituate current thinking about photography in material culture and new materialism to give purchase on the nature of collaboration and creativity. The aim was to open up a discussion of the effects of a shift in the weight of agencies, particularly authorship, and the consequent explanations of causality when technologies change in ways that realign the work of the human. The thesis was helped in this work by a further hunch that there was something to be found in a rather neglected photographic artefact – the contact sheet. In this thesis, this overlooked artefact has proved to be a valuable conduit between the body of the photographer, the matter of the photograph and the cognitive process of the human. In using the contact sheet to argue that the agency in the photographic process is variously distributed amongst

all the actors, human and non-human, in this dynamic, the thesis proposes that all photography is to some extent non-human. The importance of this claim is that first, as a practising photographer, experimentation requires an engagement with the materiality of the technology. This requires access to the materials of engagement such as the processes of production and their subsequent power relations; the design of components, and the otherwise black-boxed complexity of interactions that make the photographic event possible. Secondly, the camera is a highly standardised technical apparatus that can be said to program its operators to see in a certain way and as a consequence, the cognitive processes of the photographer have tended to be overwritten by the authority of the apparatus. Thirdly, whilst the post digital theoretical discussions in photography largely remain concerned with our rapidly changed and changing relationships with digital technologies or contrasting the differences between analogue and digital, few shift the focus from social relations to broader relations necessary for understanding how the move to automation has displaced human agency.[62] Attending to these three concerns could help us understand the entanglement between bodies, technologies and images – between nature, technology and culture –necessary for examining the balance of agency in technological meshworks.

At the start of the research for this thesis, I had imagined that I was making a specific contribution to the way that we understood photography in a post-digital context. It perhaps should be no surprise that in a thesis highlighting collaboration, networks and meshworks, its resonances should be wider. For example, discussing distributed agency required engaging with cognitive studies of collaboration and creativity, yet neuroscientific

[62] With the exception of a few notable new media theorists such as John Tagg (1998), Jonathan Crary (1993) and Geoffrey Batchen (1997) who have sought alternative ways of thinking through new media's relationship to the past. In particular, Batchen is a key figure who investigated the historical crossovers between analogue and digital photography. His historicisation of photography in parallel to Babbage can be seen in a simple model of the complex of histories 'through' and 'against' which new media emerge. Although these studies offer a more complex view of technology, they tend to focus on technology as a cultural construct and its influence on culture and human development.

methods for understanding cognition and the dynamics of the creative process was fraught. Currently, these fields use limited models taken from cognitive psychology that exclude the body in an environment as a site of cognition. Furthermore, much of this research into the cognitive process of the human mind is understood through theoretical and experimental methods undertaken in the laboratory. These reductive methods that atomise the functions of the brain, use systemic theoretic approaches, representations of the brain and simulated experiments and environments which have little correlation to the changing dynamics of the lived world with all its complexity and contingency. Having witnessed many research projects as part of my doctoral training programme with *CogNovo* there seemed to be a common misconception among cognitive scientists, especially those who do their work in laboratory settings, that research conducted outside the laboratory is 'applied' work. It seemed to be overlooked that there are many reasons to look at the 'real world' that is not concerned with hoped-for applications of research findings from the lab. This, of course, was a topic that Latour thoroughly explored, although without a great deal of attention to cognition. As a consequence, I sought models of cognition that included the body, tools and environment as sites of cognition. I discovered James J. Gibson ecological model of vision and cognitive anthropologists such as Hutchins, Ingold and Malafouris whose focus on cognitive ecosystems using relational models of cognition broke the paradigm. In addition to rethinking photographic practice as a relational ecology, I realised I was also writing a kind of cognitive anthropology of collaboration and creativity. In the history of anthropology, there is scarcely a more important concept than the division of labour; in terms of the energy budget of a human group and the efficiency with which a group exploits its physical environment, social organisational factors often produce group dynamics that differ considerably from the properties of individuals (Hutchins, 2015). Similar sorts of interests exist in the cognitive domain. However, in the emphasis on finding and describing knowledge structures that are somewhere inside the individual, traditional anthropology and cognitive studies have largely overlooked the fact that human

cognition is always situated in a complex social, cultural, material and agential world and cannot be unaffected by it.

One of the problems of studying cognition in action (outside of the laboratory) is that there is a concealed meshwork of evidence and making this visible can overemphasise the role of individual components. This is acknowledged in many ethnographic studies which, although a valuable source of information, recognise that the subject is to some degree aware of being observed and this distorts the object of study. This is especially significant in examining the processes of creative collaboration. A problem made more demanding by the spontaneous constituent of all collaborative work in creative practice. Somewhat paradoxically, it seemed there might be some relief to this problem if I drew on insights from my own experience as a photographer/filmmaker. I tested the generality of this by spending some time observing and working with professional photographers and cinematographers, working with complex technological arrangements with teams of professionals working to assignment. I was also fortunate to draw on fifteen years of teaching in art schools to be able to reflect on the interaction between spontaneity and declared intention. One consequence of these experiences was the degree to which the contact sheet seemed to provide a trace of the photographer's cognitive collaboration with the camera apparatus. As an authentic part of a photographer's practice, in this sense, they can be seen as an unselfconscious record of the collaboration between the photographer, their tools, and the world. In this thesis, they are used as the strongest evidential resource to explore the relationship between the photographer's intention and their negotiation with the world as a meshwork of forces.

The thesis began by laying out the problem of the anthropocentric approach to photographic practice, in which the emphasis on the human idealised the camera as a simple instrument that privileged an indexical relationship between the photographic image

and the world. In contrast, non-anthropocentric approaches offered alternative perspectives from material culture, new materialism and posthumanism. These were used to rethink dominant assumptions in the literature by (i) situating human cognition and action as distributed which (ii) opened the way to rethink the photographic apparatus not as an inert technology subject to the forces of an unreconstructed concept of progress but rather as an active agent working in collaboration with the photographer and the world (iii) and to reconsider photography as a manifestation of many meshworks of collaboration. This offers a more complete understanding of the different play of energies and model of causality in support of a new kind of process ontology of photography. In chapter two this critical framework was applied to one the most influential concepts in discussing documentary photography, namely 'the decisive moment'. In this chapter this concept, based on Cartier-Bresson's practice, could be understood in a way that did not privilege the author over the other determinants including chance and serendipity. In particular, it revealed the complexity of decision making that is inaccessible in the final photographic image but yet leaves a trace elsewhere in the processes. Chapter three turns its attention to the contact sheet as evidence of this process. It offers a rationale and methodology for reading the contact sheet in its entirety as well as a sequence of discrete images. This detail allows the contact sheet to be seen as more than an adjunct or whose afterlife is part of the cataloguing process. It can be read as a reliable source of evidence by attending closely to the details of the decision-making process. It becomes a map of a meshwork of the interaction between the photographer and camera over time and in response to the world as a dynamic continuum of change. The method of close attention to the materiality and metadata information visible on the contact sheet (negative numbering, pencil annotations, etc) was used in chapter three to analyse Jonas Bendiksen's series *Satellites* (2000). It added a dimension to his iconic image from the series, providing a thicker reading that exposed the essential collaboration in and with a world as his actions and reactions were indelibly inscribed as a total image. The chapter uses this to discuss the problematic understanding

of the relation of cause and effect in the photographic image and using evidence of both the contact sheet and Bendiksen's accounts to reveal a non-linear causality in action as the event unfolds before him. Chapter five brings together two examples of sports photography set apart by seven decades and radically different technological arrangements. The first, the filming of the 2019 Cardiff Marathon from a helicopter. Evidence from the RF plans, the footage and field experience not surprisingly reveal sophisticated preplanning alongside contingent opportunism to produce the image. Seventy years before, Kees Molkenboer, confined to a medium format camera with only twelve exposures, produces images of football matches that share with the technologically a more sophisticated arrangement of the Cardiff marathon the same extended cognition situated in an environment. The outcomes in both cases reveal the distribution of cognition such that alternative accounts of causality inscribed in the traces of the photographic processes extend beyond the image and are for the most part invisible. The final chapter examines the photographer's collaboration with the apparatus as a changing field of engagement. It identifies a distinction between some photographic practices that are unselfconscious of the effect that this has on the decision-making process and argues that this impinges on the vision of the world that underlies the image. It contrasts this with practices that foreground a recognition of the components of the meshwork in order to expose the underlying premise of the photographic apparatus a mediator of perception that produces an illusion of the human as the central agent in the understanding of the world. Although this may not be a revolutionary insight in relation to photographic literature, it does seem to dissolve as the transmutation of technological form in photographic practices more fully embrace the digital. Indeed, its apparent technological inevitability reinforces an anthropocentric critique to compensate for the technological displacement of the human agent.

7.1 Photography and collaboration

The thesis evidences the prevailing way in which photography is dealt with in photographic and art history, through a focus on particular canonical individuals. This emphasis on the individual photographer and authorship is perhaps understandable since most cameras are designed so that only one eye fi ts behind the viewfi nder (now a screen) and only one fi nger presses the shutter release button. Camera usage, in turn, is driven by the illusion of individual photographers imprinting on a recording surface their unique view of the world. The leisure technology of the camera is treated as a neutral mechanism for the translation of that vision, but the design, promotion and use of the camera are, in reality, caught up in a consumerist ideology of possessive individualism. It is this individualism which has helped to perpetuate the figure of the lone photographer as an enduring myth in histories of photography at the expense of other narratives that stress the fundamentally collaborative nature of the practice. This thesis introduced feminist science and new materialist reactions to dissolve this radical constructivism by emphasising that physical bodies moving through the world, and the differences in those bodies inform experience. Feminist theorists began to emphasise the material of the body, considering differences among bodies, and to think through the intersections of material and social constructions. These theories together with posthuman subjectivity raise important ethical questions since it is neither bound to the individual subject nor singularly human. Unlike other writing on collaboration which centres solely on human interactions, this research was not interested to understand what happens between individuals in the professional photographic production between editors, printers, publishers and distributors. Its concern was to reveal the varying play of agencies in the collaborative meshwork between the photographer, camera and world during the photographic event. In conclusion, this thesis refigures the practice of photography as an inevitable feature of both human, non-human and technological predisposition for co-production (collaboration) whilst revealing the apparent cultural predisposition to disavow such co-production. This thesis developed this line of

argument showing that creativity may owe much to the contradictory tensions between these two. In this sense, and more generally, this argument may offer a more holistic insight into the relational nature of collaboration and creativity.

7.2 New literature and some implications of this research for further work

I began the research for this thesis in 2014 and during this time there have been some quite dramatic changes in the way that photography has become part of daily life and how it has been discussed in academic and artistic settings. What has unintentionally emerged through this research is the extent to which writing a relational framework for rethinking photography has flagged up many ethical and political stakes. As the practices of photography have infiltrated our lives in ways in which most of us still do not understand the extent of, the medium has become almost entirely politicised. This is also reflected in the emergence of several investigatory artists and research groups whose aim is to expose the imperceptible technological processes and the subsequent exercise of power through the automation of vision on an enormous scale. A number of recent publications have begun to tackle the implications of these transformations by offering new ontologies of photography in relation to the different implications of the changing power relations in photographic practice that has begun to distance the photographer.

Reflecting on this Bollete B. Blaagaard (2015) writes how the meaning of presence in journalism is taking on new forms, as the photographer, bystander or journalist may be absent in body but remains present in digital form and interconnected with the digital technology. An example of this would be through drone imagery, satellite imagery or citizen, guerrilla or street journalists who play an active role in the process of collecting, reporting, analysing, and disseminating news and information. Presence has been crucial to journalistic photography and filming, the materiality of the witness (the photographer) is necessary for the photograph to have significant authority. However, due to the

technological advances in recent decades, the understanding of temporal and spatial presence, as well as the understanding of whom and what is a photographer, or a journalist, has been discussed extensively. This understanding of witnessing as a relational movement between technology and subject calls into question the idea of the unitary 'self' also questioned by new materialists. What happens, for example, if the body or the journalist-subject is no longer self-evident (Harraway, 1997). The relationship between the object, the audience, and the knowledge production – or meaning – may still be intact but mediated and technologically enhanced and entangled. Feminist theorists of science and technology such as Haraway, Barad and Hayles, among others, have also been influential in developing thoughts on the implications of technologically entangled subjectivities. One consequence, as Blaagaard concluded, is that the introduction of the camera into the smartphones marked the end of the auteur, the author, the professional photographer and the photojournalist as these professionalisms are replaced by a different media landscape of citizen-generated media.

A significant contribution in this thesis was to introduce recent new materialist perspectives to examine the agencies and interactions of matter to argue for a fuller understanding of the collaborative nature of photographic process. A key figure for this was physicist and philosopher Karen Barad (2007) who expanded aspects of Niels Bohr's philosophy-physics to be applicable beyond the hard sciences into the fields of the humanities and social sciences. Her concepts of agential realism and intra-action have been particularly useful as a way of understanding the intra-actions of nonhuman agencies in photographic practice. Looking at the dynamism of matter she offers a quantum ontology which attempts to reformulate the concept of relationality and reworks how causality might be conceived. She points out that matter's dynamism is generative, not merely in the sense of bringing new things into the world but in the sense of bringing forth new worlds, of engaging in an ongoing reconfiguring of the world. These insights gave weight to my argument to rethink

theories such as the index, the problems of representation and notions of photographic truth.

It was both frustrating and reassuring to see a number of publications emerge towards the end of my write up process that articulated this key move in this thesis. One such book by N. Katherine Hayles *Unthought: the power of the cognitive nonconscious* (2017) turns to the systemic effects of human technological cognitive assemblages. Although her discussion does not focus on photography, her aim is similar in that she breaks with the anthropocentric views of cognition using a framework that enmeshes biological and technical cognition. Hayles points out the degree to which technology has technical autonomy because the speeds at which they operate far transcend the temporal regimes of human decision making. She investigates the ways in which minds and bodies change when they incorporate devices or technical processes that enhance the psychological abilities and physical capacities of mind and body. Although Hayes was a key resource for some of the particularities of human-technological assemblages her account tends to exclude any specific discussion of agencies of matter as a persuasive factor.

Other recent significant authors articulate an understanding of posthuman photography by addressing the complexities of digital photographic technology and its systems that displace the human– as its subject, agent or addressee. These discussions by authors such as Johanna Zylinska (2017) and Sarah Kember (2015), Daniel Rubinstein and Katrina Sluis (2018) usually begin with the withdrawal of the eye and finish with algorithmic modes of machine communication. Although these authors have been helpful in providing some of the complexities of this shift, they weren't able to provide in-depth discussion on the cognitive aspects particularly the enmeshing of biological and technical cognitions. However, notwithstanding these critical interventions in this thesis, it was important to preserve the material knowledge and technical understanding in any discussion of

photographic practice. Perhaps then chapter six was a natural place to conclude this thesis where it became clear I needed a different kind of skill set to describe the materiality of cameras that had now become small computers. The surpassing of human vision marks a moment of convergence where theoretical discussions move away from technical components and sensory phenomena to a discussion of concepts.

7.3 Why do we need a more complex explanation for understanding photographs?

During my years at art school experimenting with various film and digital imaging technologies, the 1990s photographic literature seemed entirely concerned about the fact that digital images lacked an 'original'. Since then, transformations in the digital technologies of the late twentieth century have provoked anxiety amongst theorists of the photographic image that seems related to the loss of its material presence as it has become reconfigured as data for a potential (rather than fully materialised) image, encountered on a screen, if at all. As aforementioned, the problem that cultural/media theorists are having to wrangle with is that when images exist as data, humans are not the sole observer of images. The overwhelming majority of images are now made without a camera, instead, images are made by machines for other machines, with humans rarely in the loop.[63] As visual culture has changed form and become increasingly automated and detached from human vision, the ways in which we have analysed images through representation, semiosis, mimesis, are not fully sufficient. The machines that analyse these images do not have psychological, social, semiotic references at least in the way human observers have come to understand

[63] Examples of machine-to-machine seeing apparatuses include Automatic License Plate Readers (ALPR) mounted on police cars, buildings, bridges, highways. ALPR operators like the company Vigilant Solutions collect the locations of every car their cameras see, use Optical Character Recognition (OCR) to store license plate numbers, and create databases used by police and insurance companies. In the consumer sphere, Euclid Analytics and Real Eyes, among many others, install cameras in malls and department stores to track the motion of people through these spaces with software designed to identify who is looking at what for how long, and to track facial expressions to discern the mood and emotional state of the humans they're observing. Advertisements, too, have begun to watch and record people. All of these systems are only possible because digital images are machine-readable and do not require a human in the analytic loop.

those terms. Since traditional media theorists seem unwilling to grapple with the infinite complexity of the black-boxed mechanics of these new forms of technological images, they tend to focus attention to the larger social-technological implications. For example, how when we post an image on social media, we are feeding an array of immensely powerful artificial intelligence systems information about how to identify people and how to recognize places and objects, habits and preferences, race, class, and gender identifications, economic statuses, and much more. Whilst there has been a recent proliferation of publications that attempt to explore new photographic technologies, these socio-technological accounts tend to focus their concerns around the ways in which these technologies impact human lives with little attention to making visible their structures, their hidden inner workings and critically deconstructing the entire process. They tend to regard the camera as a conceptual object rather than as a technical object. For instance, all computer vision systems produce mathematical abstractions from the images they're analysing, and the qualities of those abstractions are guided by the kind of metadata the algorithm is trying to read. Taking the meshwork framework established in this thesis to a discussion of machine vision systems would make a close material analysis of the collaborative agents in the entire *dispositif*, including; an analysis of the image capture technology, and where it is mounted, the effects of environmental conditions, the agencies of matter and energies, the distribution of agency. These factors have direct implications for understanding where decision making is deferred in complex systems, distributed responsibility and morality, the biases and prejudice's implicit in the algorithms that read images and the consequences of algorithms (and software developers) in creating visual aesthetic standards.

The inherent ambiguity in the photographic image signals the importance of a more thorough methodology for an understanding of the photographic process; one that factors in an awareness of the complexity of the negotiation that happens during any photographic

event. A consideration of the negotiation between photographer, camera and world attunes us to all that is not consciously or intentionally controlled in the making, circulation, and viewing of photographs, the contingency involved in the production and consumption of images, in addition to the unexamined motivations and effects of this technology's pervasive spread into ever-widening spheres of human and nonhuman activity.

With the growing popularity of camera-enabled devices, photography has become commonplace: a trivial, routinely and mindlessly engaged practice. The photographic act has largely become a series of brief, predictable actions, without much thought or consideration on the whole interaction. As the technological apparatus becomes more complex and given that there appears to be no place for human freedom within the area of automated, programmed and programming apparatuses, a number of key questions should be addressed such as; how can we show a way in which it is nevertheless possible to open up a space for freedom? How do we redress the balance of human agency given over to machines? As the thesis makes clear we can turn to people Flusser called 'envisioners', that is, disrupters who try to turn an automatic apparatus against its own condition of being automatic. The role of an artist or cultural producer is to work against the tendency of machines to standardise and homogenise, to strive for the improbable as opposed to the probable. The arts are called upon to develop viable strategies to counteract the overwhelming power of social and technological control and visual aesthetic hegemony. Through techniques such as defamiliarisation or artistic interventions that disrupt the apparatus[64], artists that pay more attention to the processes of production may restore a sense of uncertainty and randomness to the quotidian photographic moment.

[64] Seen in projects such as Sang Mun's ZXX (2012) disruptive typeface that is unreadable by OCR text scanning software.

In light of recent world events assisted largely by media manipulation and disinformation research groups such as Forensic Architecture (Goldsmiths) and artists who use evidential realism approaches understand the evermore crucial need for more complex understandings of the entire photographic process and the dominant strategic functions of apparatus. Where the perpetrators of crimes have more sophisticated access to equipment than the investigators i.e. access to satellite imagery especially in government-imposed media blackout countries, this requires a critical and practical enquiry into the materiality of images, programs and apparatus to see where manipulation has occurred. It also calls for AI investigators to take a critical approach to understand the biases of algorithms that underpin all search and sharing processes of images.

This work of this thesis was to show new understandings of old practices and new understanding suitable to new practices. Introducing new materialist approaches to think about the photographic process invites us to revisit longstanding and foundational questions about the nature and scope of meaning and subjectivity, and how these relate to questions of ontology, ethics, and political intervention. This thesis places the collaboration between the camera, operator and world at the centre of a way of thinking about these questions. Such recognition of our entanglement as sentient and discursive beings in complex biological and technical networks is necessary if we are to become involved, seriously and responsibly, in any kind of photography, philosophy or other critical or everyday activity in which we aim to exercise free will and judgement.

Postscript

Throughout this period of sustained enquiry, I continued my practice as a photographer and filmmaker although with a necessary reduced intensity. The research for this thesis has provided deeper insights into the ambiguities, resistances and ideologies inherent in the materials and apparatus of photographic and film practices. This has had resonances

towards my own practice and so I conclude with a brief reflection that is given here as a postscript.

This thesis indirectly questioned the way that the established canons have been formed. Although not explicitly addressed, this thesis may add to recent discussions in media studies around decolonising the camera. Western photographic practice and theory have been used as a tool for creating Eurocentric and visual regimes – a problem that the Magnum agency has most likely perpetuated through its dominant visual style, one of many visual cultures that is built upon colonialist and imperialist legacies. Photography is an inherently racialised medium, as already touched upon, in the way that the dynamic range of film emulsion and certain camera sensors fail to distinguish the facial features of people with darker skin. A relational understanding of photographic practice makes us alert to not only the biases in photographic material processes but also calls for a critical awareness of the ideologies programmed into the image-making apparatus and the algorithms that then reinforce representational stereotypes. As Impett (2017) points out "the ubiquity of such systems is leading to a 'double hermeneutic', of visual aesthetic hegemony" (n.p.).

It was perhaps no surprise that throughout this research I was reminded of how photographic histories are very much weighted towards specific male figures from the canon. During the primary research stage, I entered into many fields of professional photographic practice such as sports reportage, journalism, medical simulation, fine art, historical archives, publishing and curation and was surprised to see how gendered these professions still are. The stereotypes persist - using equipment is a male activity - women still stand in front of the camera (as TV presenters, subjects, muses). This is not only reflected in the current advertising webpages of professional camera equipment of manufacturers such as Sony, Canon, Leica, Blackmagic, at best women feature in the amateur photography sections but also can be experienced in the ergonomics of most

camera design. This thesis offers the restoration of feminist thinking in a new register. Using feminist science and new materialist discussions I aimed to reveal, in a subtle way, some of the stereotypes, binarism's and exclusions in photographic discourse and that persist in some professional practices.

And while the conditions of new media have generated new reflections on how we might experience and understand materiality itself, artists, like myself, still recognise a persistent desire to consume photographs through both vision and touch. In contemporary art practice, there has been a recent materialist turn that seeks to both look back to analogue processes and go beyond its limitations. Since John Hilliard's *Camera Recording its Own Condition* (1971) and the experimental structural/materialist films in the 70s, contemporary artists have continued to disrupt representation, in the conventional sense, by foregrounding the hand-crafted aspect of their material and process-based production. For example, experimental artist/researcher Karel Doing (2020) and his phytogram experiments use the internal chemistry of plants in conjunction with photographic emulsion to record molecule exchange processes between both entities. Doing's phytogram animations make visible the most basic entanglement between artist, plant and cinema in an applied form of posthumanism. Rather than being motivated by a nostalgic longing for the analogue, this work confronts the materiality inherent in photography from its earliest manifestations.

My past film practice could also be situated within the philosophical fields of thought discussed in this thesis. For example, some of the concerns for freedom from the apparatus, as described by Flusser, can be seen in a series of self-explanatory short films entitled *White things in the Mist* (2001-2008) using the autofocus function on a range of early amateur digital cameras. Watching the films, the viewer is caught simultaneously between the filmic illusion and, and the see the mechanics of this illusion, as the camera struggles to

distinguish between the white subjects and their pale backgrounds. Ultimately, agency is given to the camera as it decides the focus point.

A critical and experimental material engagement with photographic practice enables us to learn about the world through the act of photographing, not through representational depiction but learning how the material properties and agency of the world manifest to make photographic images. For example, artist Angela Strassheim, in her series *Evidence* (2014), uses a luminal-based blood visualising agent with long film exposures to activate the physical memory of blood to reveal the traces of familial homicides. Susan Schullpi explores photography's potential to detect radiation ecologies in the contact prints of tropical pufferfish caught in the aftermath of the atomic testing in the Bikini Atoll in 1946 and through the 35mm film footage of Vladimir Shevchenko's *Chernobyl Chronicle of Difficult Weeks* (1986) in which the film captured the image and sound of radioactivity itself. In this way, the act of photographing offers an emanate encounter with matter, processes and phenomena imperceptible to humans. These are perhaps the ways in which new materialism and art practice bring us in touch with alchemy. A renewed understanding of materials, processes and non-human agency.

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Appendix

1. Transcription of conversation with between myself and David Hurn, British documentary photographer and member of Magnum Photos at his home in Tintern, Wales on 30th March 2016. The discussion is focussed on the working process of professional photojournalists through the personal archive of contact sheets Hurn has amassed during his professional career.

Transcription of a conversation with David Hurn

The following is a transcription of a conversation between myself and David Hurn, British documentary photographer and member of Magnum Photos at his home in Tintern, Wales on 30th March 2016. After seventeen years working for Magnum Photos, in 1973, Hurn founded the School of Documentary Photography at the Gwent College of Higher Education in Newport, Wales which became the most successful course in photographic education in Britain. The course was revered for its elegance in its simplicity, and was based on methodology, professionalism and control. The purpose of this conversation with Hurn was to discuss in detail the working process of professional photojournalists through the personal archive of contact sheets he had amassed during his professional career. The contact sheets we are discussing in this conversation belong not only to Hurn but to documentary photojournalists that worked alongside him at Magnum, namely; Henri Cartier-Bresson, Bruce Davidson, Leonard Freed, Burk Uzzle, David Douglas-Duncan, Don McCullin, Constantine Manos, Justine Franck. The images of these contact sheets inserted into this transcription were very kindly photographed by Hurn and his assistant.

JK: Early on in my research I realised that the photographer's contact sheet is a useful artefact for tracing some of the processes of cognition in action. Generally, artists seem most interested in unconscious processes of cognition – how you intuit something, how you move around and feel and experience to solve problems. Neuroscientists and cognitive scientists believe cognition resides within the brain and are therefore more interested in higher rational reasoning, how we might problem solve, in a more intentional way.

DH: Can you not problem solve with intuition?

05.00

JK: Yes, this is why I'm interested in the contact sheet where it's possible to trace some of the process of decision-making frame by frame. It's possible to see how a photographer might think in intense situations and how he manages the complexity of the moment. How he or she manages the potential for something about to happen, how he is negotiating the dynamics of other factors in environment and testing different compositions. All those kinds of things are part of a wide cognitive process.

DH: I suspect you see. It's there. If you are a person that looks and sees and not stage directs. I presume you're talking about seeing them. I think to me there are two things; one is an instinctive, emotional attraction to something, then the secondary thing which is seeing the geometry in the situation. I think they're different processes. They come together, but I think, that particularly for me as I am shooting, I can tell the difference between the two things.

JK: And what happens when you're in a moment which is really intense, and things are unfolding really quickly around you? Do you have time to think out that this needs to go here and there, or is it something that you can feel?

DH: I think in very simple terms, a picture for me is primarily about an emotional feeling about the content. To project that so that the emotion of that particular thing is projected to the audience and separated from the great muddle of life around it. This can be done by geometry and design. You sense two people are there and they are reacting to each other, that's an emotional thing, from an instinctive, emotional thing. Then we have to get in the position where what they're doing is projected and that's where the geometry comes in. If it is particularly good, it projects what you feel emotional about. As what is happening in front of you is moving, the geometry is changing, and you might have to move with it, a foot this way, or that way, or down or up a bit. It is all to do with projecting whatever that is you're trying to put in the picture. The geometry is there already, you're just moving around to try and keep it in balance. That's what you can see in good contact sheets, you can see those subtle movements. As a person's hand goes out there, the photographer moves slightly otherwise the picture is no longer balanced as the hand has gone from here to there. That makes the photographer move from there to there.

JK: So there's a balance of form and emotion when it feels instinctively the right moment?

10.00

DH: You could argue that they're totally one, but I would argue that they're actually two, but they're both so instinctive that they become almost like one, but I certainly in my own mind find myself separating them. I am looking and saying 'this is potentially a good situation here, how do I find the best place to stand'. As a photographer you basically only have two controls, where do you stand and when do you press the button. So if you stand in the right place at the right time and press the button at the right time, you have a good picture. So, once I sense that there is a potential of a picture in a place, then what I am now doing the two things are happening together obviously but I am very conscious I am moving to the right or left, I am predicting in advance where I have to go to be because I can see something happening or that looks interesting therefore the first thing that I have to do is get closer, once I am closer I need to make up my mind where I am going, then at the last moment I am looking through the viewfinder and thinking 'is this the right moment?' 'is this the right moment?' and the reason you tend to take sequences of photos is that you don't know what's going to happen next. Very often you look at a contact sheet and you can read what the photographer is trying to get and then you realise they haven't got it and it finishes. It's not a waste of time, if something had happened, he wouldn't have actually got it. If you are really concentrating, the best photographers you can see the enormous concentration on their faces. They don't want to be caught out between the frames. What is puzzling is that you would think that the way to get around it is to take a little sequence, six pictures or something but it doesn't always seem to work. I don't know anybody who does that, I don't think my peers, I don't know anyone who works like that.

JK: So, you think giving yourself up to the automatic functions of the camera does not work for many photographers?

DH: I don't know anyone who works with automatic shutter mode. There's so many people write about what a photographer certainly doesn't consciously think about. Quite a lot of photographers are dyslexic which is interesting. I find it fascinating.

JK: I this presented at Greenwich Museum. In the paper, I used Jonas Bendiksen's contact sheets from his *Satellite* series. The only real literature out there is the Magnum contact sheets. It's very brief. I was quite surprised there was so little literature about contact sheets.

20.00

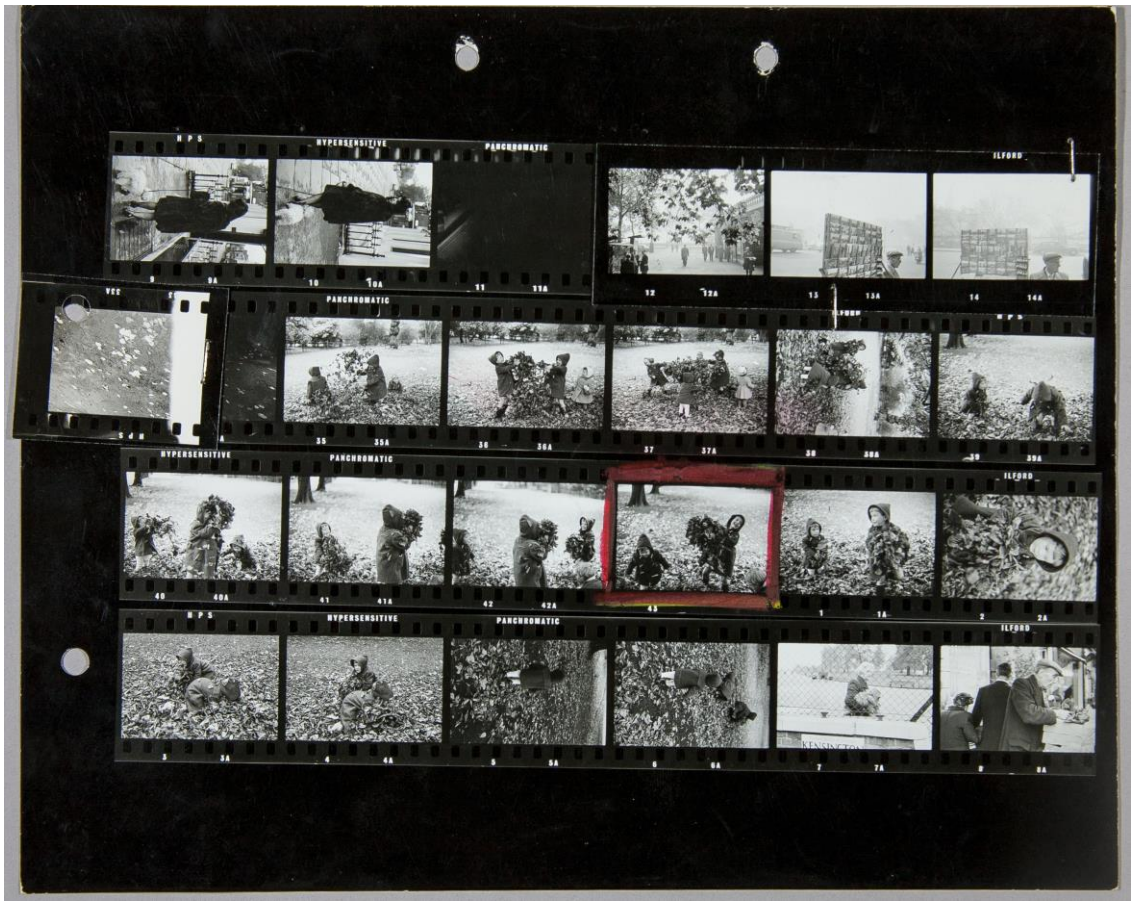
DH: I suspect a lot of that is because so much of that is amateur photography. Camera clubs and things. The amateur photographer usually takes the one-off picture. They tend to go for a visual picture almost like shooting a landscape, even when shooting their kids at home, therefore they don't have the equivalent of a contact sheet. It's a lot of single pictures, it's the person who shoots in a contact sheet who is a professional photographer. Even that way of shooting is comparatively recent. Certainly, up to 1818 the process was on a huge big camera because you didn't have the equivalent of a contact sheet as you took one picture of everything. Then when it went to being a dry plate process in 1880, Kodak did their 'you press the button, we do the rest' thing then it became an amateur process, before that it was a rich person's process. By and large again you didn't have a contact sheet. You didn't have these until as late as the 30's when you began to have the smaller camera. You got it with the invention of the Lyca camera. It meant you could be very mobile and you can't do that with a big camera. One reason, I suspect it was never discussed is because it was not there. The big camera does not lend itself to the contact sheet, although the slightly bigger camera now does. It's almost forced on people as a way of working.

JK: I was trying to find early examples of contact sheets but didn't have much luck. In fact, getting access to research contact sheets has been a problem in general. Through other well know photographers and writers I have tried to gain access to archives such as the Magnum Photos archive in London. Apparently, there are only four photographers who still use analogue film. They are very reluctant to let me look at any contact sheets in their collection. I am not sure why.
25.00

DH: My guess is that they don't have any anymore. [Hurn shows me his collection of various contact sheets] These are contact sheets that I have got. This is a contact sheet by McCullen in a war situation. Even though this one is almost identical, his experience tells him that as he shoots the person is subtly going to change. He will know that in that situation he had better get the best picture and so he will not care about shooting more than one picture. If Paul Strand had been shooting that picture, since he shoots on a large format camera, he would have almost certainly have shot just one picture.

JK: How much would you say, is he working within the restraints of medium format?

DH: You tend to be more static. You can't move around. Here you can see all the way through, it's subtly different. Here you have Bruce Davidson's contact sheet where you can see I am reading into this that he has seen an emotional thing – two kids playing with leaves – that's an emotional scene and you think gosh, there should be a picture here. He is moving around the scene and suddenly, I would agree with him, that this works [pointing to image 43 marked in red]. Now, if he just shot one picture, it could've been that one or that one, but the reason he has got this one, which is a very beautiful picture, it's because he is shooting in that continuous sort of way.



DH: And here's a Cartier-Bresson contact sheet [above] you can see the very famous picture of Matisse with the doves. You can see the same process in how he is shooting.

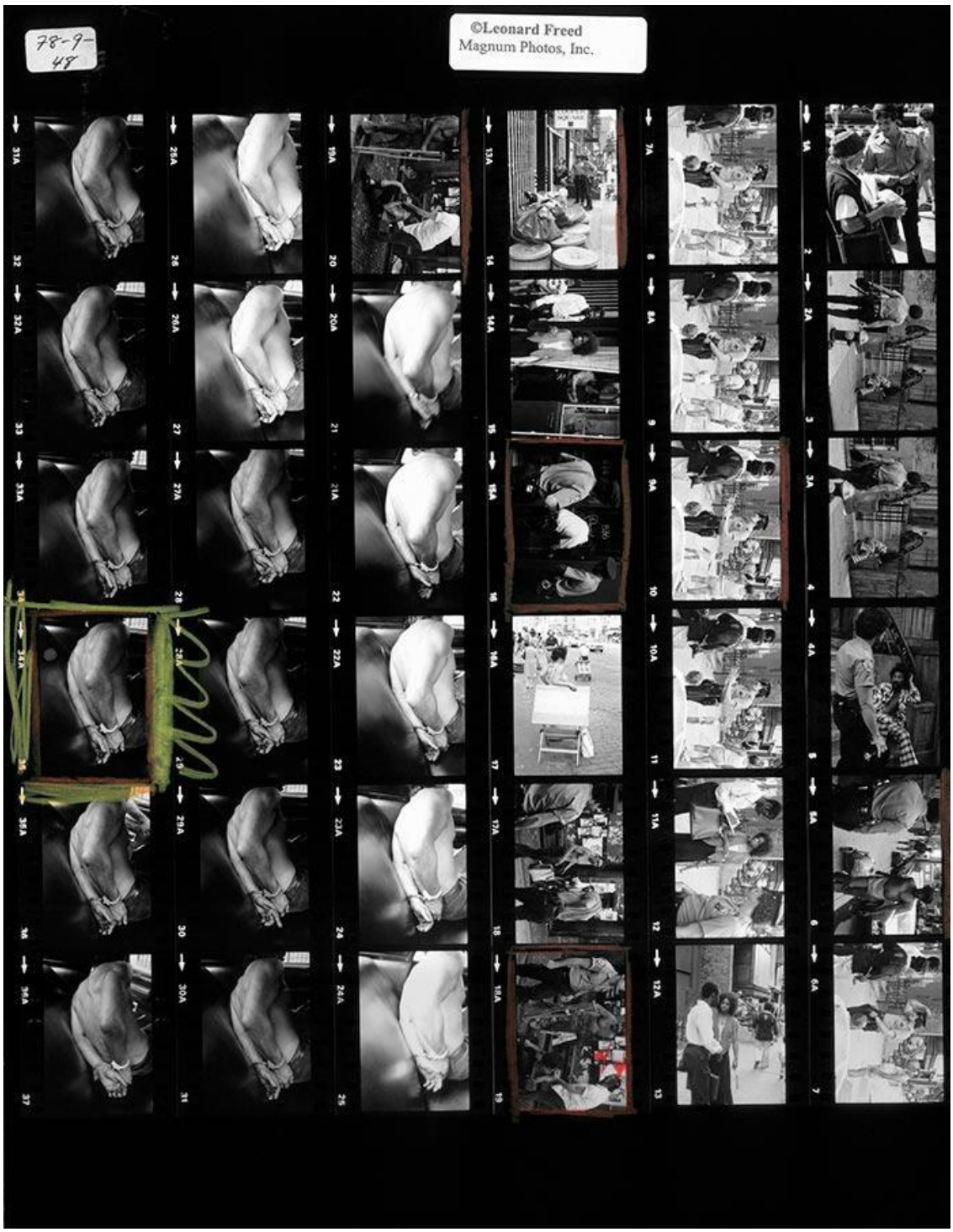
DH: Here we have another Cartier-Bresson, where you can see he is drawn to the kids playing on a bank, and he has found himself a framing that he likes, and what he is doing is shooting as they do things to suddenly decide this is the best one [frame 16A marked in red] You can see there is a combination of event, emotion and geometry, or whatever you want to call it, but he is conscious of both and you can see the exact thing happening here. Where he's taking a series of pictures because he does not know exactly how they will move, but for some reason he likes this one better, the better example of it [frame 16A marked in red]. He has found this geometry, he likes it, he feels the thing. Suddenly she moves and looks this way and it becomes a better picture.

JK: It seems to me that most professional photographers will look at a contact sheet and agree on the same picture.

30.00

DH: Yes. If you are used to looking at lots and lots of pictures you are the equivalent of a concert pianist who has been practicing for 12 years before even playing live, then you begin to start seeing it. People who just start, don't. They are drawn by 'oh, there's a pussycat in that picture and I like them', but it's not the same as looking and saying…

This one is fascinating, is that the only thing static is the background and it is obvious, but for some reason he likes this background so he has stayed there waiting, thinking that something might go through it and it might make something. What is interesting is that the images don't come to anything, but the contact sheet isn't any less valid because you can read this contact sheet and see his thought process. That is why when I set up the course at Newport, the course was based around the contact sheet. The idea is that if you could begin to get into your mind this process, I think you can learn to become a better photographer.

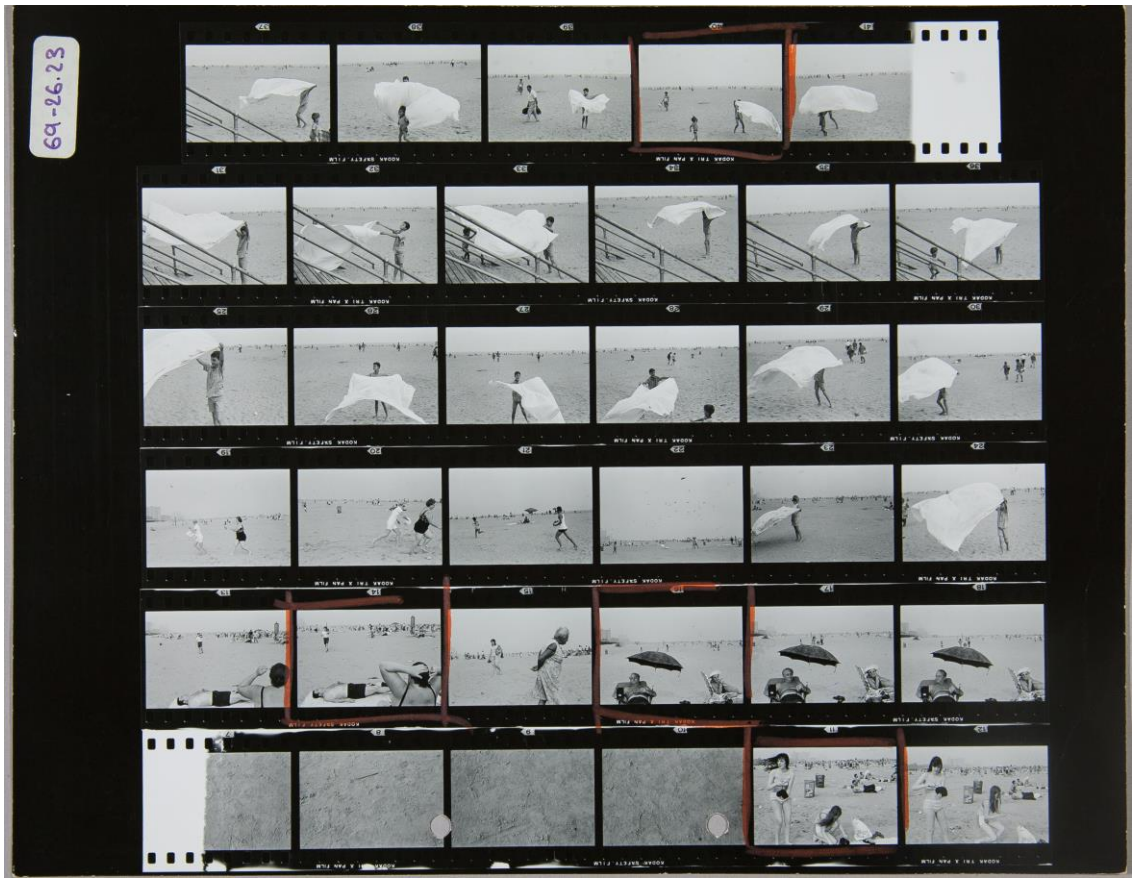


DH: This is a Leonard Freed contact sheet, when he did a big story about a murder in New York and what I'm reading on this contact sheet is that he is suddenly in this privileged position of seeing this man in a shackled position. The contact sheet shows that Freed is not proud, he shoots lots of subtly different pictures because he doesn't know which will be visually the best. You never know, particularly with film, you might get a kink in the film, so when you're in a privileged position - work it, work it, work it! That's the message from the contact sheet.

JK: I know some photographers dislike showing their contact sheets as they expose failure. What I particularly like about contact sheets is they dispel this idea of

genius. That a photographer might be in exactly the right spot at the right time and the distilled moment or decisive moment seen in the single image somehow becomes a confirmation of this myth. In reality, in the contact sheet, we usually see how indecisive the decisive moment was, how drawn out and very precarious it is.

DH: Yes, to me, people who don't want you to look at anything or read anything, they're insecure basically. My guess is that they're not going to be that great. It's the same with photographers that won't discuss the idea that they're working on, as though somehow someone else will do the same idea. If they're any good they will do their own! The basis might be the same, but they would each have a totally separate set of pictures. It's just insecure in my opinion, yet a lot of people do that, as if they're part of some secret society and ideas are hard to come by - particularly young people nowadays do that.



DH: This is Burk Uzzle. It's California… This is an amazingly clear contact sheet. You can see that Uzzle has found this scene interesting, but various things have happened but he doesn't mark any of the pictures up. In this case he obviously thinks that the design of this, without that is better…

35.00

JK: Were these the contact sheets you used to teach with?

DH: Yes.

JK: Do you have scans of these?

DH: We don't have scans. I can certainly give you some scans though, the only problem is that because of copyright you can't use them. You would need permission. It would be to do with circumstances. Usually, there's no issue if it's for educational purposes.

JK: The second one, the image of the war, there's something really powerful holding the contact sheet. It's almost like holding the moment in your hand.

DH: Of course, it sets up again, all sorts of questions which kind of always come from academics, but not from photographers. People say to me there's something immoral about shooting lots of pictures and consciously trying to make a picture out of a situation. I never understood that, the job of a photographer is to make a picture out of every situation and document it in the best possible way, which is the mixture of content and design. All the design does is makes the person looking at the picture, look at it for a longer period of time. We like design! So, if a picture is good, good geometry, it will make you look at it for 5 seconds rather than 1 second. It holds your attention because it is more pleasing to look at, it doesn't make it safer to look at. It grabs your attention.

JK: In that sense the photographer is the mediating body through which you communicate the event to a viewer and the function of 'geometry' is to hold the viewer's attention?

40.00

DH: Absolutely. Then the photographer puts his very subjective/objective, a strange combination where the photographer has authorship and 'objective' but is trying to be honest. The photographer is not trying to lie, he is trying to give his feelings about something else and he does that with the combination of his feelings and the geometry, which helps him crystalise that moment in to a single image. I guess the difference is that the single picture seems more poignant than the movie, it retains more. The tension is much more poignant. The problem with a movie, the next thing wipes the last one, which doesn't happen with a single picture. We remember the classics, Hindenberg and so on.

JK: Do you think the viewer is more active in decoding what is happening in a single image?

DH: I think you probably are because you are concentrating more on it. If it is well crystalised then the viewer can really look at it for a long time. What is interesting is that the decoding is in two parts, the documentary part, I suspect is 99.9% of people looking at Kate there would say she has got a scarf on, they would say she has a watch and a bit of metal in her nose, there's a mass of that sort of information that everyone will get, but what they interpret from those things will be different in every single person. That's not what the photographer is trying to do, he is simply trying to give his vision of the thing. The interpretation afterwards will be subtly different to everyone. One reason I like working with poets is that they look at my picture and they by definition are very precise in language and if they write a poem about a picture I have taken it allows me to see precisely

what someone else is thinking about that picture and how different that is. I find that process almost the most interesting thing that I do and like doing. I did a whole thing with Welsh Review where I worked with 12 poets and I found it fascinating. To see what a poet writes about a picture. The problem with people that write about photography, a lot of the time they write in a way that tells the viewer how they ought to look at that picture, rather than their own interpretation of that picture. I find that just silly, really. What they are doing is saying 'I am the most important'.

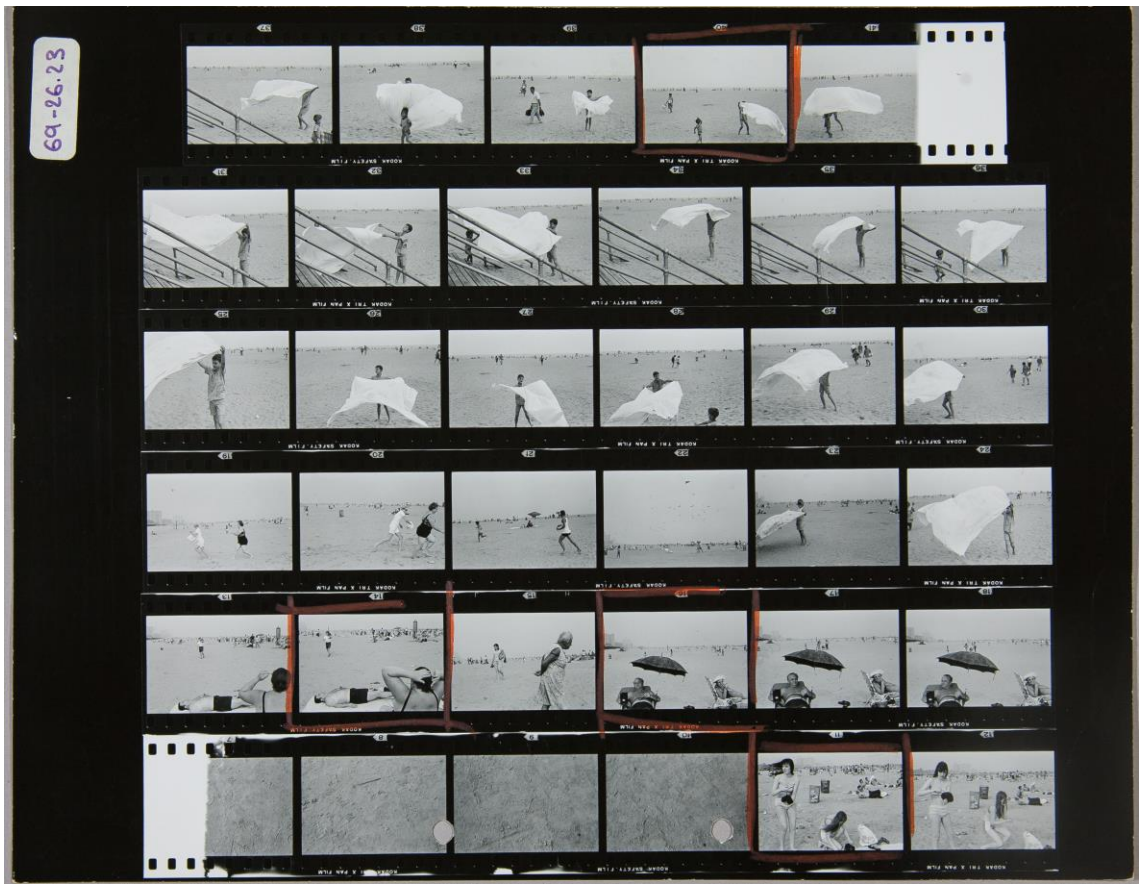
JK: A what about the slipperiness of the documentary image?

I suspect looking at a picture, you start off with a whole lot of straight documentary information. I suspect most of us seem to think that, therefore we should get the same meaning from a lot of people. It's a trace. It's fascinating though because it doesn't. You would expect photography to be incredibly precise about meaning and it isn't… why? That's a puzzling concept and that's what I love about it. If someone could sit down and explaining all about photography, I wouldn't want to do it at all. It's like the word 'love', the reason it is fun to fall in love is because it isn't something that someone can analyse, the act of falling in love to me is like taking a photograph. You look at the photograph and think you ought to be able to come to the same conclusion about it as the lay person sat next to you and the answer is that you don't and that is lovely!

This is a Bruce Davidson thing but you can see this whole process of something he enjoyed and he has followed, and taken lots of photos of it and not marked anything up because nothing quite works, but you can almost sense him working at it, looking at the contact sheet. *46.30*

JK: Most of the images in each of these contact sheets are of a singular event or place, how many rolls of film on average would a professional photographer use in a day?

DH: He [Bruce Davidson] would've been shooting continuously! Bruce shot a lot. My guess is that he would've shot 15 or 20 rolls a day. I once went to Arizona for a year and I wanted a particular roll of film and I went in and said can you order some for me and he asked how many and I told him 2000 rolls! The look on the man's face! I had an agreement that they could keep it in their deep freeze and could collect it when I wanted it. Professional photographers shoot a lot, I mean people out there, by and large, most of the time shooting, they probably shoot 100… I still shoot 10 or 15 rolls a day. So that would have been him, wandering around London. This is all around the streets of London [images of changing of the guard] It's wonderful, in these, he is just wandering around the hills and what he is interested in is so far away. The little figures and the landscapes.



DH: You can probably tell who that is by because it's so similar to the other one I showed you. It's Burk Uzzle. There's a strange, cleanness.

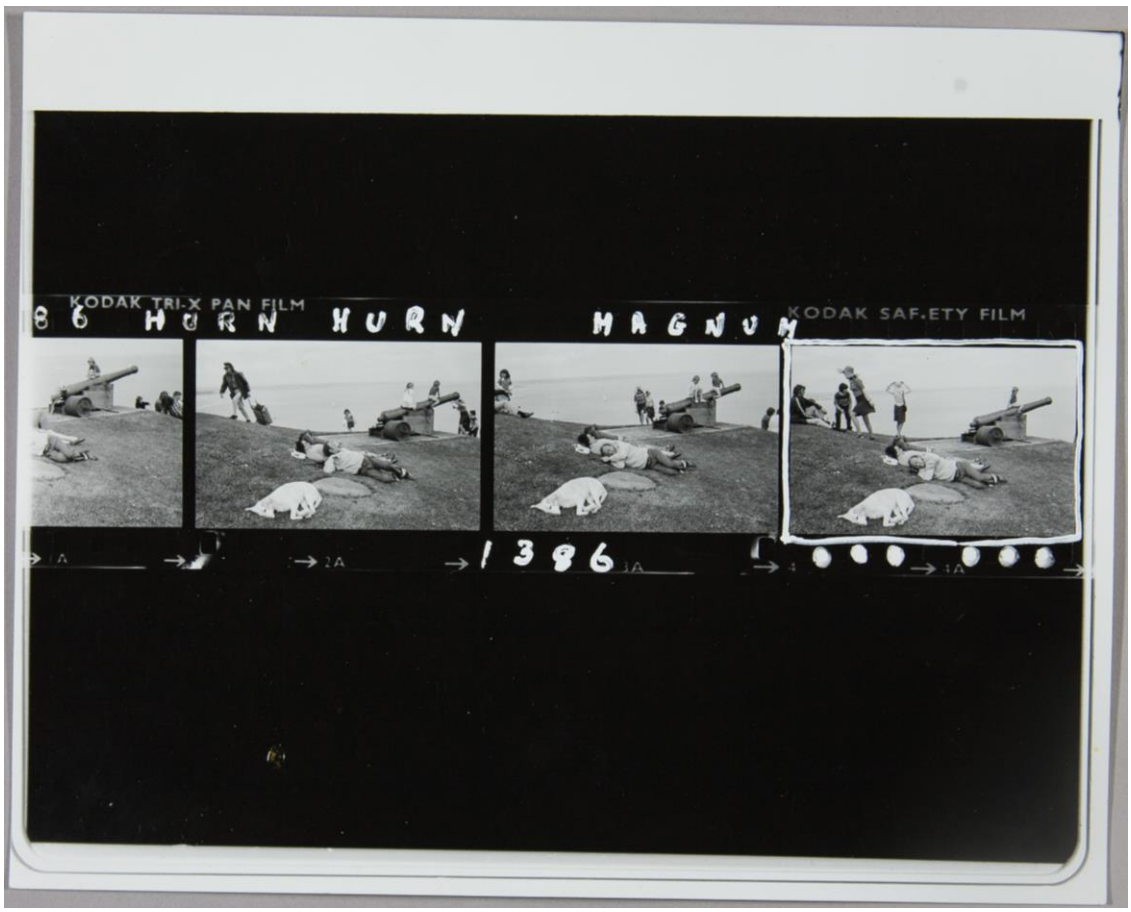
JK: A perfectionist.

DH: Absolutely. He was fixated on technical quality. He would grab everything and spray it all white and then sprayed a room all white because he wanted the ultimate exposure so he could photograph white on white. He spent ages doing this whole series where everything was white. He was saying 'how on film do you photograph white on white?'. So you can still see what the objects are.

DH: This is interesting, Robert Kennedy, you can see on the contact sheet he [Manos] is covering an election process. He needs close ups and to show the environment the person is in. As he moves around, he gets in position, shoots a sequence then gets to another position.

JK: That's interesting because he is restricted by the crowd, he has to anticipate where he is going to move to find a composition that works.

DH: This is something I did a film for the BBC for. It is an easy thing; I was wandering around and saw these people sleeping with a dog and it didn't quite work as a picture. I remember standing there and nothing happened. I went to the other side of the hill and saw these people photographing these people. That became boring so I wandered back to where they still were. The dog woke up and went back to sleep. I began to get this thing of people meandering. These figures here are in a bit of a muddle then suddenly this would become an iconic picture of Wales. This clearly shows how that is happening.



JK: There's lots of movement. Your eye is drawn to the relationships between them.

DH: It's a good example of lots of movement. What has happened, there is the nice thing of the person holding the hand, but the geometry is near perfect.

JK: And where is it?

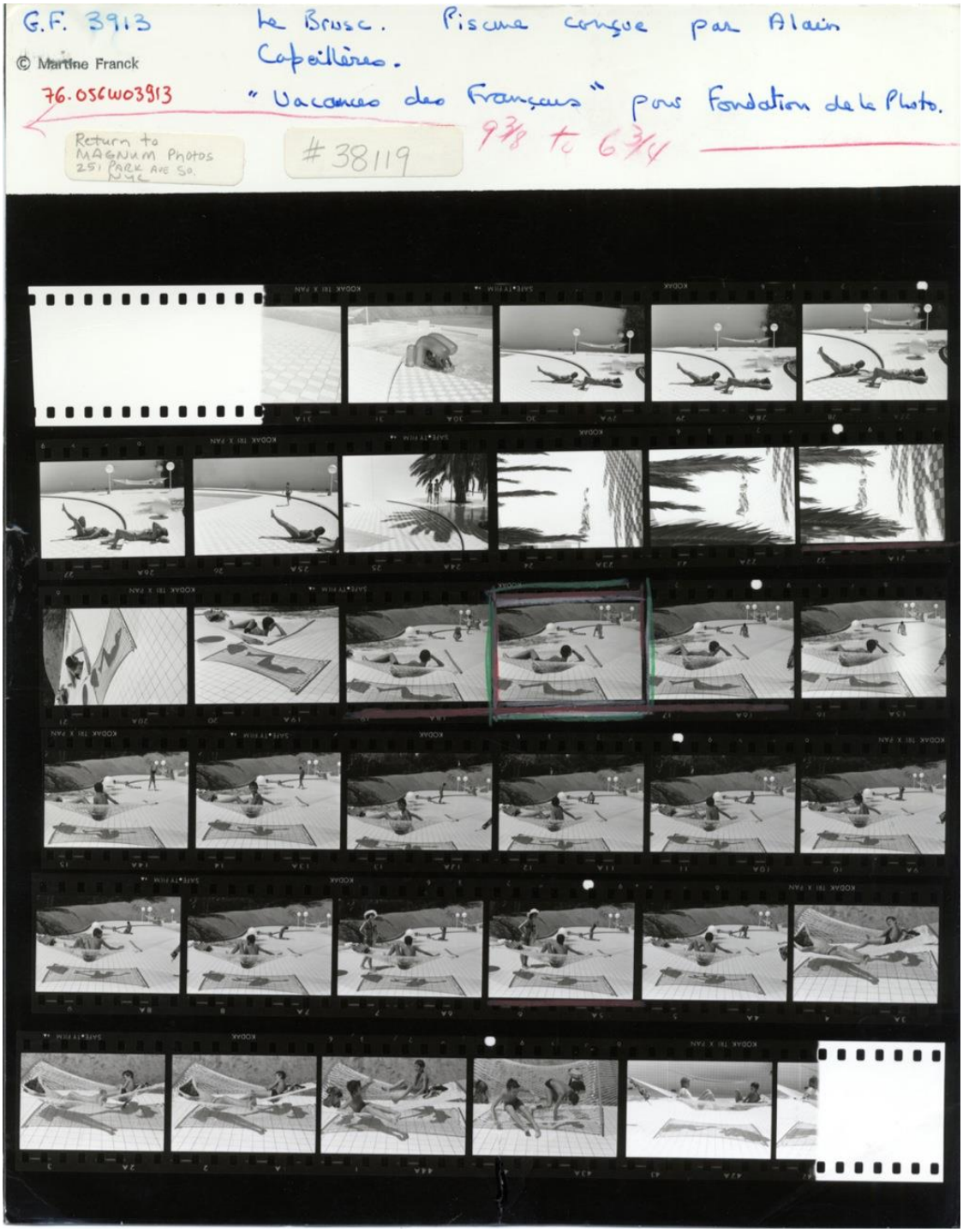
DH: Tenby.

JK: Justine Franck?

DH:Yeah and Justine Franck.

JK: I almost wrote about this contact sheet [Justine Franck] instead of Jonas Bendiksen's.

DH: One of the things I find is that the geometry and the feel of it is so perfect that in an age of digitalisation now, I think that a lot of people would think it is artificially constructed. It is so perfect and for me, the joy of it is the fact that it is a moment in time. A real moment in time. That's why I think it's absolutely imperative that people don't change anything in Photoshop et cetera, because for me the miracle of photography is the fact that some people can find that moment in time that is so perfect. If you write that down, you might be able to find it.



JK: Are you working digitally now?

DH: I work only digitally; I don't understand why anyone does anything different.

JK: At what point did you change?

DH: The second that I felt that I could produce the same end product as I was before. To me basically, the camera was the box with a hole in the front that let light through and light came through like a trace and it puts on the back of the camera and if the back of the camera was plasticine then you would have a thing of hand on plasticine, or snow you'd have a thing in the snow or sand or whatever - it's the same trace that's coming through

this hole in the front of the box. For me, what's in the back of the box creating the record - that is irrelevant. All that is interesting to me is the trace that comes through to the front. Whether it be an amber type or an albion type or et cetera, the important thing is the trace that has gone though. So, by and large I don't find the processes that have gone through very interesting other than the people that love process. It's like people saying that they are not very interested that something was by Rembrandt, and that they're more interested that something is by a particular type of oil painter or that it was by this or that. There's obviously subtle differences between these things.

JK: Do you find that you work differently with a digital camera?

DH: Not at all.

JK: So even the restrictions of 36 frames?

DH: That was more difficult. If there is a difference, it's that you're freed up and you can do the process and contact sheet even more. You were bound a little bit before. Not least that if you were not rich it was a very expensive process. Film processing was very expensive. Now it doesn't cost you anything! So I am sure that subtly that makes a difference. Not so much to me because I was reasonably successful therefore didn't think about buying film and that sort of thing, but I suspect to a lot of people, particularly photographers from Ecuador or Nigeria, places like that, I suspect the sheer cost of doing it would stop people doing it. I suspect now there are photographers coming out of Nigeria that are shooting on an iPhone! None of the things happening with digital do I think are bad things. Although I guess there are some bad things, one of the great beauties of the contact sheet is that you can see what was shot before and after therefore it is difficult to fake it. With digital you don't see the before or after shots so you don't know that this is an altered image or not, it's basically impossible to tell. Though that's more a question of taste or morality than the process of shooting. Shooting, I don't see any difference. I remember when first doing it and some photographers found the problem was that they could see the picture on the back and think it looks ok and then not take any more photos and then afterwards it's not as good as you thought, although the solution to that is to just carry on taking them.

05.00

JK: Do you look through the viewfinder?

DH: Very rarely. I look much more now way after the thing to see if it's in focus or not.

JK: Do you create contact sheets from digital images?

DH: No, just online. One thing I don't do is delete anything. I put everything on there. I find it much more difficult, or much less enjoyable to look at things on a screen rather than on a contact sheet. The contact sheet has always been an extremely enjoyable thing. It's

probably the difference between a paper book or reading it on an iPad. The physical book is much more enjoyable, I think.

JK: Because contact sheets have 36 frames typically of a singular event or maybe divided into different scenes, do you think their material physicality acts as a stronger mnemonic than the stream of digital photographs we now experience on a screen?

DH: It's exactly the same as a contact sheet. Although we would previously work with two cameras, as the vast majority of photographers would work with two lenses. A 28mm and a 50mm, or 24mm and 35mm dependent. One of the bores about film is that I could shoot a picture of you in wide angle then switch to a 50 and shoot Dan and then the next something else, then you find that the whole thing becomes out of sequence, because on the wide angle you've shot many more different situations on the one contact sheet because you only shoot the picture that is the location picture on it. If I go through contact sheets sometimes you realise you have shot a picture and you realise that you have taken 10 contact sheets before and you've since done many more before processing that film, but you don't get that with digital so much, you go and press a button and it puts it in the right order. You can also filter with time or date and so on and it removes that difficulty. From that point of view, digital is much more convenient because it fit in with the sequence. You still have that total sequence if you only shoot with one camera, obviously, but the second you work with more than one camera you end up in a muddle. Most people shoot with 2 because of complicated reasons, with viewfinders and things, but mainly because you don't want to keep changing camera to different lenses.

10.00

JK: I was wondering about what the contact sheet affords, for you specifically… is there a fundamental affordance? When I look at a contact sheet for my writing, it affords an individual vision - I can see how a photographer will have seen the world, but also if you're talking about decision making, for example, its possible to see that indecision is very much part of the process of decision making - perhaps? It also affords a view of individual approach, thinking in action, selective attention… the process of production? And materially, I can see they have used an Ilford film…

DH: I think a lot of those decisions are made before you get to the contact sheet, a lot is reflection. It is more the content.

JK: What would you say are the major fundamental reasons and importance of having a contact sheet?

DH: You only know you have a picture when you look at the picture, so I would say that most of the peers would say that they are good photographers but there's not a single sheet marked up but he didn't take these pictures to show off, every time he pushed the button he obviously thought there might have been a picture there. One thing about photography is that how most of what you do doesn't work. The fact that a picture does work is almost

a miracle, but you can only find that based on the contact sheet. You never know what would've happened if you had shot another picture, therefore if you had stop shooting halfway through you'd have accepted that as being the best, but now you are looking at the contact sheet and saying 'this picture is a better one than the previous one' so there's always now a strange balance, when do you stop shooting and that is a very instinctive process. It's usually that the event that is happening in front of you has collapsed and that obviously is not happening. That's what happens particularly, looking at Bruce Davidson. You go back to the thing with the background, obviously holding him to that particular picture, it never happened in the foreground, there was something telling him that something might happen here and in reality, it didn't happen. You would only know that from the contact sheet, otherwise most people would shoot the picture and decide that is the picture. In a way he can only decide it's not the picture when he looks at all the rest and realises it isn't a picture.

15.00

JK: There's usually a gap in time between shooting an event on a roll of film until you see what you got on the contact sheet. Sometimes I think there's one shot where I've got it and I am waiting to see the contact sheet to check I did get it and I hold the image in my head. Is that something you do?

DH: No, never. Experience has told me that I know if I have been in a situation where I ought to have got a picture, but I never know until I see the picture at the end. I guess I just got to the point I don't think it in the end because I know that 9 times out of 10 I will be disappointed. Photography is so difficult. Every other form of communication, you start from nothing, you write a sentence and if you don't like it you cross it out and write another same with painting, writing music, it's all the same but with photography, you can't do that! You are doing it the other way around, you're starting with a mess then within a fraction of a second you have got to clarify that mess and if you don't then you don't have a second crack at it, you move on to the next mess and try to clarify that. If you see the contact sheet hasn't worked then you move on to the next mess. Photography, I would argue, is by far the most difficult of the processes because in a way, you don't have very much control over it other than emotional instinct and observation. As Sherlock Holmes said 'My dear Watson, the thing is with you is that you see and you do not observe". Most people see, very few people observe. The concentration is not there to pick up all sorts of subtleties. Most people don't have that. Sergio Larrain once told me that you can tell if someone is good because you can see the intensity of their concentration. If you see Ian Berry working, nothing distracts him, he's not only making sure he is in the right position but he is looking and that's why the viewfinder is so important. You're looking for that subtle difference and you hope you are in the right place for the geometry to be correct, once you are there you are waiting for that moment but you never know that it's the right moment. It's moved on by definition and straight away after you have shot it. Then, therefore, you see something else that is maybe ok. You can't take it all in. A terrific part of it is luck and trying to force luck on to your side.

JK: Also, the way in which you have a selective attention.

20.00

DH: All you can really do is get the overall feeling right and then concentrate on the main bit and hope that the rest takes care of itself, but you can't see everything in the picture. In the case of the Bresson contact sheet he has dealt with that by having something in the frame that is static, like a tree or a bank and that is static therefore he can concentrate on the 2 kids on the toboggan there. Most of the time you can't. You have 2 people doing something in the foreground doing something and a mass of people in the background doing something. Therefore, you have that thing where you cannot concentrate on all the people in the picture, just one little bit of it and then you hope… I guess from experience you tend to subliminally sense what is happening in the background because what you don't want in the background is people looking at you because instantly it becomes a photograph, it doesn't become a picture. Unless you want that to happen. Someone like McCullen will utilise someone staring at him. His pictures are often him as a personality and the subject matter reacting to each other. In my case, I don't like that very much, I want to look as though I am invisible.

JK: Do you have the same approach whatever subject you shoot?

DH: All sorts of things come into it. One is, you are a professional photographer. You have to think about where the picture is going to be used. If I said to you 'I'd like to take photos of you for Playboy magazine', you would know what that entailed. We also know the same pictures won't be published in the Catholic Herald. That's understanding that an extreme thing, in the case of what a client wants. Working on a purely commercial thing, to me the most important thing is to keep that very much in mind. There's no point in shooting the pictures for Playboy and thinking they will be in the Catholic Herald - it's as simple as that, therefore the pictures for the Catholic Herald will be shot in a different way. If you've accepted to take their money then you will shoot in the way that they want. If you have some kind of authorship it will come through, it will still do because if they pay you, they want you to do your vision of the thing. There's not much point shooting it as someone else would do it. That's how the pretty crass commercial photographer does it. They will shoot in the same way. When talking about a certain way about how I enjoy shooting, I don't set up anything, I'm not a director but with portraits I most like to have a writer with me. Let the writer get on with the interview and I would like them to be a writer who is pretty flamboyant so there's a reaction to the person who they are talking to. I would then subtly take pictures. I might say 'you're in a bad place there' or ask them to move to a better place, in the light or something, but then I'd let the interviewer get on with it. That's how I work and how Bresson always worked - with a writer.

25.00

JK: Yes, with a writer.

DH: I tried a different approach, I did a book living in Wales, because I always loved the photos of August Sander because they're so ordinary so in that book I did a whole new

approach shooting on a bigger camera and a thicker thing. It was a deliberate ploy I tried and, in the end, I decided that the reason I liked August Sander's photographs is because they weren't about August Sander. August Sander was about the dignity of the subject, therefore all the pictures look like the person, rather than him saying 'I am as important as my subject matter' - he was saying 'my subject matter is all important' and I think that is rare and wonderful. It's dignified and in the book I made I tried to do the same thing. It's not to say it's the same as August Sander. When you see the August Sander pictures, they have a look about them, but it's terribly difficult to analyse why his look is different from other people's look…

JK: So, the approach is to surrender yourself to the subject…

DH: I am sure it could be analysed. Masses and masses write about these things and analyse it all, but nobody else can shoot a picture like August Sander, so what they talk about is crap, basically. They tend not to say 'this is my opinion about something' they tend to write as though their word is the authority. Well, if that's how he did it then I would be able to read it and then go and do it, but the answer is that you can imagine the amount of photographers who have tried to take a photograph like Bresson and they all have the same camera, lens and film and go out shooting simple things on the street but no one can shoot pictures like Bresson. That to me is the wonder of it. If they could, if there was a magic formula, I used to fantasise with the students - will there be a camera in the future where you can type in Bresson and then you walk around the streets and it locks in and shoots Bresson pictures? That's the logic of being able to describe what he does. The second that happens then that's the end of it, nobody will ever want to take pictures. I don't personally ever think anybody will be able to do that. It would be like saying 'ok, there's a Rembrandt, what he does is this and this' and then put it in a robot then saying 'go on and paint a Rembrandt'. It isn't going to happen.

JK: It's reassuring you say that because I have this argument every day with scientists in my department who think that they can make algorithms and programmes and neuro networks to find 'the most beautiful' image. Firstly, their understanding of what 'beauty' is, of course is problematic. When it comes down to it, the computer will never be a sentient human being, culturally informed, enskilled and will never understand the world as we understand it.

DH: Well if they did then suddenly the mystery is gone, and the world isn't fun anymore! My guess is that it won't happen, and I hope it won't happen as part of the fun in life is doing something that you can't do. There's a logic to it and I can understand the scientists being frustrated that you can't type in that Rembrandt used these colours and this and that, certain brush, certain information, but it doesn't come up with a Rembrandt, and if there was a possibility of that then masses of painters would have painted like Rembrandt as they know it's a successful way of doing it! Lots of people have tried, and I think it's even more miraculous in photography as the permetations in a painting are phenomenal, but photography is just a box with a hole in it! How is it that Bresson can wander around with a camera and take pictures where if you look at half a dozen of them you know they're shot by Bresson. I couldn't wander around having looked at every single picture he has ever

taken, and I cannot shoot like Bresson! It's wonderful. One can't do it. Therefore, there is a point where you say, 'why try?'. It's like students at college, it's a good exercise to try and shoot and analyse in a similar style, but what is better is to say why his pictures are better than yours! If you are going to do that, then realise they are better and the only way yours will be better than his is to forget about him and get on and be you! Most people find it incredibly difficult to be themselves. They continually want to shoot like Martin Parr. He gets £1,000,000 a year - he uses this and that and funny light and I'll do that and also make the same money - well the answer is 'you won't!'.

32.30

JK: Do you think good photography comes about by having confidence in your own vision?

DH: The whole point is that you photograph things that mean things to you at the moment you mean to do it, that's the important thing.

JK: But I think there's something about a confidence in your own conviction and vision?

In your own response?

JK: Using a response or your feeling towards something, is valid and doesn't have to be affirmed by someone else.

DH: I could make arguments agreeing and disagreeing with you… it is obvious to me that McCullen's pictures are great pictures because they look like McCullen, but I know that he suffers desperately by thinking he is not good enough. All of the photographers I know of any ability, don't have that ultimate confidence. They always feel they're not as good as they would like to be. That's what I find amusing sometimes about particularly young people now, they have this sort of extreme self-confidence in their crap. I look at it and think it's crap, but they talk as though they're God. Then I think, the conversations I had with Bresson were always self-doubt. I remember him talking with Jean Smith once and talking about how many really living pictures… he said 'Jean how many living pictures do you think you take a year?' and Jean Smith, being modest said 'not more than 20' and Bresson said 'you always exaggerate!'.

35.30

JK: What does Bresson mean by 'living pictures'?

A living picture is a picture that he feels is real, it has a feeling of authenticity about it. It links to life and a real living situation. That's two great photographers discussing whether they get 20 great pictures a year that they think they like. When Bresson, just before he died, he went through his archives and decided to make a definite edit of his pictures and it was less than 1000 pictures. That's not to say for other commercial reasons he hadn't marked up a lot of pictures, when he is talking about his own choice of pictures it is less than 1000 pictures, and we're talking about 70 years of work. That's real doubt. Other people would edit more and there's a real interesting debate about whether other people should edit your pictures or not. There's the case of Garry Winogrand who left, when he died, 1500 rolls of undeveloped film. He was so aware he might be dying that he couldn't be bothered to process them - he just wanted to shoot! He didn't think it was necessary. The problem with that is that other people did it and started to edit his contact sheets. They, of course, edited the contact sheets as they would have done, so you had these dreadful exhibitions of which he looked as though he was suddenly not the photographer he was before. My guess is he was, but the difference is that someone else did the editing process. I have no idea. I find it very interesting. I think that happened with what I think was the big mistake at the science museum was Martin was obviously very much in love with Tony Ray Jones' pictures and he suddenly decided he would re-edit the pictures and did this big exhibition and to me it was sad in a way because Martin's exhibition was not as good as Tony Ray Jones' own. The reason was that Tony Ray Jones had died when he was 32 and so obviously, he didn't have staggering amounts of pictures. He was clever enough that when he did his book it only had 50 pictures in it or something. The idea that someone else could come back in and re-edit and suddenly find another 50, was a mistake in my opinion. It didn't help the photographer. It didn't make him look a better

photographer, it made him look a worse photographer. By and large, you look at your best by tightening and tightening. That is dangerous because you can artificially produce a photographer in that way. George Bernard Shaw was an avid amateur photographer and shot over 1000 pictures in the artilery museum and I remember Bill wrote a book about him and he said 'should I make him a great photographer or not'. Bill knew that he could go and take out 30 or 50 pictures and make it look as though he had authorship. In fact, he was a pretty crappy photographer. My dog, if he shot 1000 pictures could become a great photographer. It's the difference of an amateur photographer having a good shot of one in every so many, whereas a professional photographer has a level of consistency throughout. Photography lends itself, you don't get someone who by mistake wrote a great book, or by mistake painted a great painting, or wrote a great piece of music or something like that, but in photography you do. You get wonderful, anonymous pictures. That's something to do with the nature of photography, but what you don't get is that same anonymous person can consistently shoot. So, in a way, almost the definition of someone having real merit in photography is that they are consistent.

41.00

JK: This is what you were just telling me about, the process of being selected as a Magnum member. Submitting projects and portfolios…

DH: They did for a point, when Bresson was alive, they used contact sheets. I remember showing Bresson my contact sheets, in maybe '64 or '65. Up to that point it was very much so. One reason was that he wanted to see how much work you put into it. If you show contact sheets you can't hide. It's no good you saying you're doing it continually, an in-depth project if you're doing it two days at the weekend. That's not an in-depth project in my terms. From seeing the contact sheets you saw the thought process and that went away for all sorts of reasons. Partly because it took so long to look through it all. They don't do that now, but I find it particularly with young people, the second you say to them 'I'd like to see everything you've done on this project' they get so defensive! Then you realise it's because they've done very little work on it. My argument would be that if you spent a day, two days on it, you're very much likely to have a better product. If you spent a week on it, it's likely to be even better. Now, there's a balance between how long you can afford to spend on a thing, but by and large, more time will give you a better result. I am sure not always, but by and large it's a good rule of thumb. I often quote Daniel Barenboim, the pianist, he's widely considered by pianists to be one of the best pianists in the world, I befriended him because he was married to Jacqueline du Pré the cellist and I did a piece on her. I went to a concert with him to hear him play and afterwards, we were having dinner and I was staring at him and he asked what I was thinking about and I said 'Daniel, I can not understand how a human being can play how you play! It's outside the realms of feasibility. You play better than it's possible to play'. That's an interesting concept of how anyone can be so great. I asked what the essence is of being such a good concert pianist and he said, 'you play the piano a lot'. It's as simple as that. It's a good rule of thumb if you write and write and write and write then you become a better writer. It's the same with photography. The same with perhaps everything. If you practice golf swings, you're likely to become a better golfer!

45.00

JK: Partly, the thing I am trying to write about is this idea of a collaboration between a photographer, his camera and the world. It's a triadic kind of collaboration. What you just described with the pianist, someone with an instrument or tool. Some people describe when they have a tool or device, that after using it for so many years they become so familiar with this thing and they don't have to think it anymore, it has become an extension of their body and cognition.

DH: Well, they are not going to be any good if they are thinking about it. One of the reasons people like Josef Koudelka and Bresson tend to use just one camera with a couple of lenses is that they see the world in their framing. I know, sitting here that if I was to shoot a picture of you, I know exactly where the framing would be. I am not consciously thinking of that, but in a way, I am subconsciously thinking of it. I know very accurately where that framing is. So, if I see a little group of people doing something, I can see where the frame is and I can see that I better get up and walk 4 feet in that direction. The geometry will become stronger. I can see the geometry in that picture, and because I have done it so long, I can see how the geometry changes. Then, because I have done it so long, obviously I relax, and things change but I can mentally tell what the geometry will be like when I get that much closer. That is all that has been learned. I don't think any more than when Daniel plays the piano and presses this note, then this note then this note. His head is saying it, but the overall thing is that he just plays, and you cannot, in my opinion, you cannot give the expression to that music without the technique being perfect. So perfect that you never think about it. That takes a lot of time. There's the thing about 10,000 hours of something. It's a pretty good thing. It applies to basically everything. Unless you have 3 years of background, technical thing, you are playing at it! You cannot think about the technical side of photography or writing or music.

56.30

JK: This is quite interesting, how Bruce Davidson's contact sheet has got another contact sheet stuck over the top of it?

DH: It might be another exposed piece, darker. He has over-exposed it and if you were really careful is making another bit so that it is equal. Bad photographers wouldn't. They would pretend they could somehow see. Good photographers thought it was very important to get everything right, otherwise, there's no point having it.

JK: Of course.

01.05.00

DH: I have no recollection of those images. Bizarrely when we did Magnum's Magnum, Costa Manos picked it as one of his favourite six pictures. We each had one or two or three to do. I did the edit for something before, but never marked the picture up. I love people

going through my contact sheets, it is very rare that someone comes up with something I haven't seen, I am not even suggesting that if they do, that I agree with it, but in this particular case… Costa happens to be a really good editor. Peter Marr was a wonderful editor, but some are lousy.

JK: Do you have to have a trust in your editors… do you prefer working with certain ones?

DH: I suppose it is a bit like reading a film critic or something, I don't go anymore but I did. I think I remember reading a Dillis Powell from The Times or something, I don't remember, but there's so much to see that somehow you try for shorthands to cut that number down to something more manageable and the best way to do that is find someone you trust. You read The Guardian or The Mail or The Sun and their film critic, you begin to realise that when you begin to see the films that they recommend, I guess it is like book programmes where people come on and discuss what books they like, it's the same with everything. You find people you think are fine. You trust and know they have an extensive passion or knowledge, or awareness. There's a logic that if he's a Magnum photographer he is a good editor, but the answer is that the majority are crappy editors in my opinion. Not even of their own pictures. Some people are, Jimmy Fawkes he was a wonderful editor who you could totally trust. Even if it was slightly different to yours. If you looked at his edit, you knew it would be a good edit. Rene Bury, Josef, Peter Marlow.

JK: These are agency or magazine editors?

DH: These are all photographers. One of the things you tend to do in Magnum is show each other your work and get comments on it because in many ways one of the great things is that you get comments from photographers that you really respect. The problem of showing your pictures to people is that sometimes if they want to be your friends they will say everything is wonderful. If they want to boost their own egos, they say everything you have done is crap. It's difficult to know if there's an agenda when someone is looking at something. It's very, very helpful as a photographer to know that you can rely on people to say what they mean, whether it is crap or good.

JK: This one Uzzle contact sheet is quite interesting because there's a man and a pool then we're outside to a man and a family in front of a cactus then we're inside again. The event is very split up, it feels very much like amateur photography.

DH: You see, I think one of the problems is that people think that if someone is a serious, professional photographer, everything they take is incredibly serious… but they don't. Very often they use it as 'oh I can't remember the name of this street, I'll shoot a picture of the street sign'. That shot is so you don't have to write in a bloody Magnum notebook the name of the street. I shot a happy snap of you, it's not a picture of you, it's a record so that at a later date I have a vague chance of remembering who you were!

You know, there's no way that there's a picture that'll be marked up for anything. Very often you get that you are shooting something and then, for some reason in his walking around, he's gone from… these pictures are in the equivalent of sonar and I can't see the numbers on the sign, because sometimes you can see that when they laid them out, by mistake they have been put in the wrong sequence. That obviously goes with that. Ok, my guess is that these pictures are all somebody trying to lose weight in an artificial way, having something wiggle their bum. He's then obviously, gone out of that room to outside of the building to another place. That's my reading of it. It makes sense, I think. See what I mean? Start at the bottom and they're all wiggly bums.

JK: Like a therapy centre or something?

DH: Then it goes outside the building, then it goes to another part which is in a pool.

JK: Back inside again.

DH: That's my reading and I am sticking to it!

JK: Do you do much teaching anymore?

DH: As little as possible. I think the change for me was that the time I was teaching, it was a discussion with younger people where I could talk about the experience that I had. If you were talking to bright people, they had potential and you had the feeling that they would listen to what you were saying and analyse what you're saying and take out that that they found useful. I found that an interesting process, as they would also be discussing things and I would occasionally also find something that I found interesting. Nowadays, it seems to be an argument. I suggest something and I just get the feeling that the people you're talking to, they think they kind of know.

JK: They think they know.

DH: Yes, they are like 'this is the way I want to be' and I have had people say 'I don't look at other people's photographs because I am me' and all of that. That's fine if they want to feel that, but I feel redundant in that situation. I actually, therefore, feel it is a little bit rude and because I sued to enjoy the whole process so much, I enjoy the process of discussion. All I want to do in a discussion is say, 'this is my experience and how I would have done it' and I think that's worth listening to. The second you discover that somebody else feels after a year that they know more than you do then there's no point in the discussion anymore.

JK: It shuts the conversation down, yes.

DH: Reluctantly, slowly I have pulled out from everything, including even when you talk about teaching, one implies courses and things, even to the staff. I have found that I have so little in common with the staff. If I speak to the staff at wherever, Hereford, I think the difference in conversation with what I have at a Magnum meeting in Paris with photographers that work, the difference in conversation between them and what I get with people who are teaching - it is so unbelievably different. I just find it, when you hear educators talking about photography, you think they're in a different world to the people that I know and admire. In a way, it is so complicated what they are talking about. Whereas if I talk to Joseph Koudelka there's nothing complicated! You pick up a camera, you go out and like it and take a picture of it. It's no more complicated than that really. So, in the end, I am trying desperately hard to try and stop talking to that particular group. It's not a conversation anymore, it becomes a defending attitude, and there's not much point in doing that. I don't want to defend some attitude and don't know why they would want to either. I have enough people to go and talk to if I go to London or Paris or Stockholm or wherever. Maybe that is a bit cowardly? There I have discussions with people I like and respect.