

## *Image in the age of entanglement*

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Contextual Studies

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Please note: Pronouns used are *he* and *she* except where I am aware that the person being discussed prefers *they* and *their*.

*“As the twenty-first century unfolds, it is becoming more and more evident that the major problems of our time – energy, the environment, climate change, food security, financial security – cannot be understood in isolation. They are systemic problems, which means that are all interconnected and interdependent. Ultimately, these problems must be seen as different facets of one single crisis, which is largely a crisis of perception. It derives from the fact most people in our modern society, and especially large institutions, subscribe to the concepts of an outdated worldview, a perception of reality inadequate for dealing with our overpopulated, globally interconnected world.”*

*The Systems View of Life*  
Fritjof Capra and Pier Luigi Luisi  
2014

"The camera makes reality atomic, manageable, and opaque. It is a view of the world, which denies interconnectedness...."

*On Photography*

Susan Sontag

1977

draft

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## Introduction

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### Reconfiguring language for a reconfigured reality

"...the deeper truth is, we are changing. Our behaviours and expectations are changing."

*New Power*  
Jeremy Heimans and Henry Timms, 2018

"We are suspended in language in such a way that we cannot say what is up and what is down."

Niels Bohr, 1934

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We look at, make or communicate with images every day. They are indispensable and ubiquitous. Pictures no longer exist *within* our reality. They are integrally a part of it - as are you and I.

Academics have been querying the meaning and power of photographs for most of their existence, but the conversation and related questions, just like the world, is changing. Daniel Palmer begins an essay by saying, "photography as we once knew it is all but over" (2014:144). He describes the Henri Cartier-Bretton type as "marginal" but concedes it will continue to be celebrated (ibid). That is quite different to Michael Fried's 2008 title, *Why Photography Matters as Art as Never Before?* And not quite the same as James Elkins' comment about photography being "a bit boring" (2011: loc1708). Daniel Rubinstein and Andy Fisher, however, in *On the Verge of Photography: imaging beyond representation*, tell us "...photography is only just beginning to arrive" (2013; 13). If so, what does that

mean for Ariella Azoulay's radical suggestion, photography was invented around about the time Columbus and colleagues set sail for the Americas, not in the mid-1800s as we were taught (2018a)?

The following discussion relates to the routine act of creating an image - an activity described by Rubinstein and Fisher which encapsulates the "instantaneity, simultaneity and multiplicity" of our time (2013: 13). It queries old-world hierarchical values and the erection of barriers between processes and objects, which have resulted in polar positions, linear value systems and imagined solid categorical lines. This essay is orientated towards lens-based artistic practice, which invariably includes moving and still image (despite the habit to see them as separate and different), but the implications extend beyond the gallery wall. Throughout, I will be attempting to understand photography through a lens which might be described as Post-Cartesian or non-mechanistic.

### **A Quantum influence and questions about Cartesian certainty**

*Agential realism*, coined by Karen Barad (b. 1956), physicist, humanities lecturer, and author of *Meeting the Universe Halfway: Quantum physics and the entanglement of matter and meaning* (2007) marries quantum science with post-structuralism. Here I focus, in particular, on two aspects of Barad's quantum physics-philosophy: the phenomenological nature of reality and their use of the word *entanglement*. I will also explore how Barad's concepts can be applied to photography.

Without quantum discoveries and theory, there would be no Internet, flat-screen or smartphone. Quantum science underpins today's technology. That does not mean we are living in world with rules that only apply in quantum models – note I use the word 'model' rather than scale. It does, however, suggest that the ideas and theories explored in quantum science have influenced the way technology has

evolved and are therefore influencing our expectations of reality as we integrate technology into our lives and internalise its movements.

Barad wants us to consider key tenets of quantum mechanics beyond the confines of the laboratory. This is a risky proposition, and for some physicists, seemingly beyond the pale. Nevertheless, Barad relies heavily on Neils Bohr – one of the founding fathers of the science - citing his philosophy throughout her thesis. For example,

“Bohr’s philosophy clearly contests the Cartesian (inherent, fixed, unambiguous) subject-object distinction in a way that undermines the very foundations of classical epistemology and ontology” (2007: 125)

and

“Bohr argues that quantum physics teaches us that the belief in an inherent fixed Cartesian distinction between subject and object is an unfounded prejudice of the classical worldview...” (Ibid: 359),

and

“Bohr argues that the ‘mechanistic conception of nature’ is not consistent with quantum theory” (Ibid: 126).

Barad states categorically, “quantum mechanics is not a theory that applies to only to small objects” (Ibid: 85) and “there is no theoretical basis of empirical evidence for the belief held by some that the laws of quantum mechanics apply only to the restricted domain of microscopic objects (Ibid: 324).



Scientists take issue with what they see as “scaling up” from micro to macro and are concerned about reductive conclusions, oversimplification and analogy in Barad’s work (Hollins et al, 2017), even though there are repeated warnings to avoid as much in *Meeting the Universe Halfway*. Scientists tell us “quantum forces are not relevant to our experience of the world” (Woodward, 2020) but that view negates and misinterprets the post-structural arguments championed by Barad. If post-structuralism is unfamiliar to a reader, then Barad’s arguments will be challenging. Even so, Barad is not a total outlier. Physicist Vlatko Vedral<sup>1</sup>, perhaps considered more mainstream than Barad, and Co-Director of the Oxford Martin Programme on Bio-Inspired Quantum Technologies, suggests quantum entanglement is potentially a universal force, specifically in his talk *Living in a quantum world* (2015) and his book *From Micro to Macro* (2018); a force, according to Vedral, which has been witnessed in a “growing number of macroscopic systems” (ibid). What differentiates Barad from Vedral, aside from the obvious, is the introduction of matter and its properties and processes to discursive practice, to the post-structural project.

Which of the many, often opposing quantum positions will last the course is unknowable. What is more certain, and highlighted by several science and philosophy authors, is that the Cartesian/Newtonian/mechanistic view of reality is under a good deal of pressure today as we return to a more holistic view of reality. Physicist Carlo Rovelli, physicist and systems biologist Fritjof Capra, Professor of Natural and Social Sciences Nicholas A. Christakis, philosopher Julian Baggini and neuroscientist Alan Jasonoff are just a few authors who have gone to great lengths to explain why a Cartesian worldview, in which objects and meaning are separated, mind body dualism unquestioned and disciplines disconnected from each other, may no longer be useful. Instead, they each tell us, reality is a set of interconnected

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<sup>1</sup> Vlatko Vedral’s writes about science in an accessible tone: and describes the Cartesian worldview in *From Micro to Macro* (2018) simply and clearly, while barely using the term, presumably aiming to keep it friendly and approachable.

relationships between processes. However, in some quarters, this discussion is argued against, purposefully ignored, or simply absent.

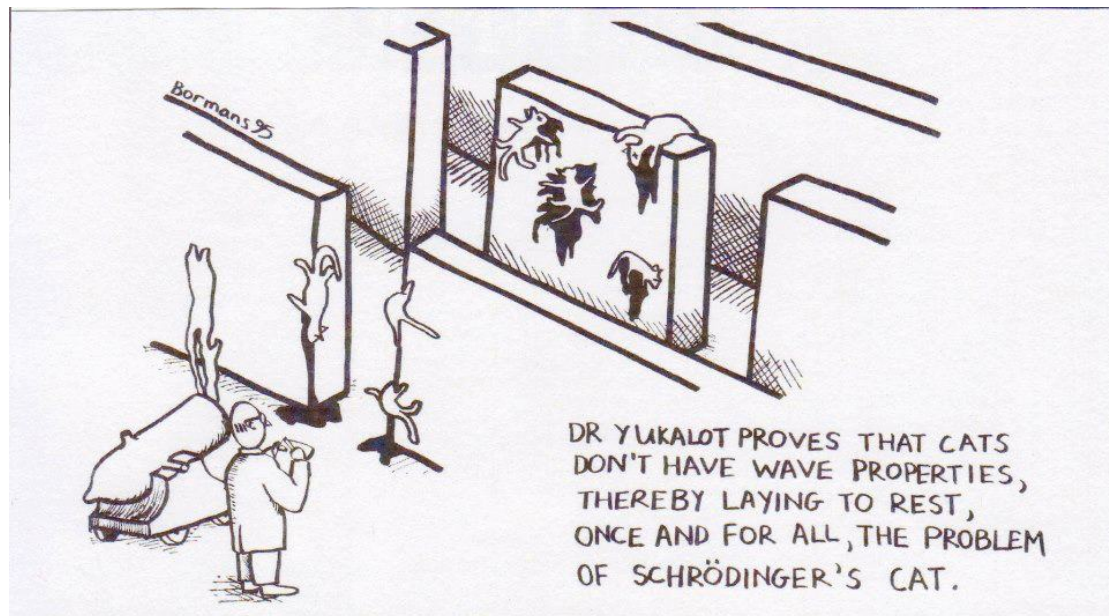


Figure 1 Scaling up quantum entanglement is not without its conundrums (Bormans, 1995, included in Vedral, 2015)

In mainstream critical theory, we are still talking about the indexical nature of photography - but what if photography and its well-worn theories are entrenched in a Cartesian view? Does a still image's fixedness and definite frame reinforce the idea that reality is reliable and ordered, that photographs (and everything else) are unrelated, discrete objects in a void universe. And why are we students encouraged to continue separating still and moving image, even though they both derive from the same basic activity, capturing light? Kember and Zylinska in *Life After New Media: Mediation as a Vital Process* cite Jacques Derrida who has difficulty with the word 'process' (2012: 80) because it implies there is never any "stasis, states, halts" in the flow. A still photograph demonstrates the mistake in that assumption; it is always part of a process. Film or photography, whether one frame or 24 per second - is, say Kember and Zylinska, an attempt to "make a memorable cut into the temporal process" (Ibid), in other words, our perception of life being lived. And

once we've done so, photography and film are both "most readily associated" with representationalism (2012: 71).

Barad acknowledges it takes enormous effort to un-see the world as a Cartesian puzzle (Ibid: 49). The difficulty is compounded because the vocabulary, syntax and associated subjectivity, which make such a discussion possible, are alien to most of us, and consequently for many, simply unintelligible. Are Rubinstein and Fisher, Palmer, Elkins and Fried all writing about the same thing? That is, to query how we see, and how we value what we see in the age of entanglement. In spite of the limitations of language, conventions and understanding, in the following paper, I hope to find out by exploring the shifts discussed in depth by Barad and what impact they have on our understanding of perception. *Part One* is a whistle-stop tour of some key phrases (by no means exhaustive), needed to address the irrevocable entanglement between meaning and matter, explored more widely in *Part 2* especially in relation to the photographic image.

## Part 1

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### Words, things, and relationship

"The separation of epistemology from ontology is a reverberation of a metaphysics that assumes an inherent difference between human and nonhuman, subject and object, mind and body, matter and discourse."

Karen Barad, 2007

Agential realism, a term coined by Karen Barad, provides us with a model that aims to undo patterns so embedded, they are exceptionally difficult to see or challenge. Agential realism rejects the traditional categorisation of objects, the separation between mind and body, real and phenomenological, matter and discourse, human and all other life (2007: 185). Agential realism does not provide the only doorway but it emerges from quantum science, which has had such an impact on our technology, and draws on a tradition that photography academia should recognise - poststructuralism and critical theory – making it an appropriate place to start. Barad tells us poststructuralism, should not be undervalued or dismissed, as it deconstructs and critiques power.

"Poststructuralism ... is not just some high-tech toy that humanities scholars use to entertain themselves. Poststructuralist approaches aim to take seriously the concerns of the 'motley crew', while offering alternative understandings of power and subject formation... including an examination of the constitutive effect of exclusions" (2007: 59).

Barad's fundamental interest is in challenging value systems that enable nations to drop experimental bombs on other nations and view entire populations as 'nothing'. Barad is motivated by wanting (Western) to query what have taken for granted, and to deconstruct long-held hierarchical categorisations – regarding class or race, gender or human exceptionalism, for instance.

Barad references several poststructural theorists, referring often to Jacques Derrida (1930 - 2004) and Michel Foucault (1926 - 1984). Here, I examine correlations between Barad and Giles Deleuze's (1925-1995)<sup>2</sup> ideas. As we might expect, like the reality they both describe, their concepts are entangled across disciplines, through space and time, drawing on older texts and ideas, knowledge and educated conjecture. In Barad's agential realism, meaning arises out of an interwoven dance between material and discursive practices, and not as something imposed upon reality, not separate. It is emergent. For Deleuze too, there is no Utopian plane waiting to be represented. Meaning and matter exist in a ballet of constant *becoming*. For him, there is no being, there is only becoming – to believe otherwise is fantastical. However, in order to explore the entanglement between image making and a contemporary view of reality, we will need to briefly cover the following:

#### **i. Intra-action**

Scientist Carlo Rovelli goes to great lengths to describe quantum science to general readers and explains how the cornerstone of quantum physics is, that it is relational and particles only ever "materialise when they interact" (2016: 100). Barad, however, says the word 'interact' does not do justice to the fact that relationships operate inside and outside of particles, often at the same time; the word *intra-act* is more accurate. Intra-action expresses enmeshment and constant movement. We should

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<sup>2</sup> We should note, Barad is critical of Deleuze and dismisses some of his language as irrelevant (2007: 437, n80).

envisage reality as a continuous, shifting, malleable, buzzing process that is not inhibited by the boundaries we humans see.

Digital material used by artists can make the idea of intra-action overtly visible, either in animation or when viewers are able to alter an artwork in some tangible way – we can witness the effects of our relationship immediately. However, still (fixed) photography is also an intra-active medium. In a still photograph, meaning fluctuates and alters depending on its relationship with time and place and an observer (maker, audience, human, non-human).

draft

**Figure 2 © Zanele Muholi, *Buhlalu I, The Decks*, Cape Town (From ongoing series *Somnyama Ngonyama* - 'Hail the Dark Lioness') 2019**

I might have used any image from the canon of well-known traditionally referenced photographers for this example in order to prove a point (and did in earlier drafts) – representationalist objects can be viewed as intra-active despite obvious limitations and we don't necessarily need to reject them outright. However, in Zanele Muholi's work, the intra-active narrative referencing colonial history, racism, fashion, gender politics and the history of photography and its apparatus' is made all the more

powerful due to the irony of embracing the photograph and photographic conventions to highlight its complicity. Images from *Somnyama Ngonyama* are not simply photographs of a black woman. Muholi's work is made with the medium most culpable in the creation of a universal "image of whiteness" - a term coined recently by Daniel C Blight (2019) while drawing on Stuart Hall's critique of the "white eye" (Ibid: 2013).

Muholi is playing with discourse manifested materially, but tangible alterations to physical material itself that come about through time can make intra-action more explicit. Artists might choose to hurry that process up by intervening in some way: by cutting, pasting adding, constructing, deconstructing, or focusing on signs of entropic decay of the object, rather than, or in conjunction with original content. Michael Subotzky, another South-African attempting to deal with the colonialist history that has had such an on-going impact on the country he lives in, "Dismantles Depictions of White [capitalism's] 'Founding Fathers'" (Harris, 2020) in a project with a working title of Gangsta Series deconstructs images of mythologised Western figures (Ibid).

Figure 3 Mikhael Subotzky working on Edmonia Lewis (American, 1845–1907) © Mikhael Subotzky / Magnum Photos

However, we see meaning transform before our eyes in Sohrab Hura's edit in *The Coast* (2019) thanks simply to repetition and constant alternative juxtapositions. The book contains many images; each one is reproduced at least twice, predominantly on the same pagination side, frolicking with Walter Benjamin's (1892-1940) critique of reproduction and prompting questions about context and meaning. Each iteration is positioned beside a different image resulting in a plaited weave of syntagmatic possibilities, which I found disorientating, never being sure if there were two or, in fact, three iterations. The repetition moves us forward as we might expect in traditional narrative but at the same time, also edges it backwards, perhaps echoing the way civilisations develop and scientific discovery unfolds. Another viewer who looked at it with me found it disorientating in a different way, demonstrating the intra-active involvement of the observer: reminding us how each



element, signification, signified, repetition, volume, text, author and audience all intra-act in a continuous state of becoming.

We are told in a review the artist's intention was to show us how "realities are increasingly being engineered today" (Clausing, 2019). What he ends up showing us is how all-important context is whether engineered or accidental, integral to a reality that is an on-going, dynamic becoming of intra-active relations (Barad, 2007; Rovelli, 2017: 115).

draft

**Figure 4** Sohrab Hura, *The Coast*. These images both appear twice but alongside different photographs, on pages before and after respectively, derailing a sense of the forward arrow of time and reinforcing the importance of context. (2019)

## ii. **Agential cutting**

If a Cartesian cut severs, then an agential cut is instead an intra-active on-going editing process, in which editor, film and editing equipment are all enmeshed agents: forming and reforming elements of the reality they are each constantly

making and a part of. Barad repeatedly reminds us how quantum experiments demonstrate we are not external observers but inherently part of the phenomena we observe. Nor should we think of ourselves as objects inside a reality that surrounds us, shaping and determining who and what we are without any input from ourselves. We are agents, instrumental, fluid elements in a “dynamic ever-changing typology” (2007: 177). We are pattern cutters but also woven into the abundance of material (information) available to us, potentially enmeshed, while simultaneously being cut intra-actively by it, and what we make of it. Donna Haraway, another name who features in Barad’s and other books influenced by agential realism, describes human beings as compost, “intertwined in a rich dense matter in which boundaries between objects cannot be distinguished” (Lupton, 2019: 26, citing Haraway and Franklin; 2017: 50). This is not an easy concept for us to embrace. Enmeshment is a pejorative term in couples counselling, for example. It is distasteful and unhealthy, and possesses something of Julia Kristeva’s ‘abject’. In her book about data and human selves, Deborah Lupton writes:

“The abject is that human or nonhuman thing that arouses feelings of discomfort and disgust because it flouts cultural boundaries such as those routinely defined between human/nonhuman, Self/Other, female/male and inside/outside. In people’s efforts to conceptually contain their bodies/selves to achieve the modern Western ideal autonomy and individuation, they seek to expel the abject from their bodies/selves to try to make themselves clean, pure and bounded” (2019: 57).

In popular culture, this enmeshment was expressed as terrifying, unnatural and potentially lethal in the critically unsuccessful 2018 science fiction film *The Cloverfield Paradox*, in which a space-crew are catapulted into a parallel universe after a particle accelerator goes awry on a space ship. By ‘messing’ with science and attempting to disrupt the so-called natural order, two universes become enmeshed

and a human being from an alternative one is found entangled within the walls of the spaceship as a punitive consequence. More successful vehicles such as *Ex Machina* (Garland, 2014) suggest that the fragility and filth of the human can only ever be equated with loss of control and weakness in its human characters, when faced with a pristine human simulation, the android, which is also, not coincidentally, a psychopath.



**Figure 5 From *The Cloverfield Paradox* (2018), a critically unsuccessful film which explores the combination of two universes as violent, terrifying and potentially catastrophic**

Rather than find it terrifying, we might consider what an agential cut means for “responsibility and accountability” (Barad, 200: 175). By seeing reality in this way, agential cutting rejects the idea of nature vs. nurture. It allows for and makes us integral to progress, change and development. There is no compunction to see the universe as fixed, none to think you were born with the genes you were given, and that is that. Or else, to believe environment shapes everything: who and what you are entirely. In an agential realists’ view, reality is a continual becoming, of which we are a part, so there is always intra-active plasticity and potential, simultaneously from within and outside. Of course, this thinking extends beyond ideas about genetics. In

Alex Garland's 2020 series *Devs*, the character Forest is a Silicon Valley billionaire who runs a quantum computing company with a secretive division which has recreated an alternative reality that can be watched and re-watched, rewound and fast-forwarded too. And into which Forest will eventually 'retire'. Forest insists on a block universe – everything has already happened at some point in the universe, the future is a done deal. He rejects the idea of a multiverse with different realities – one in which his dead daughter might never have existed. (There is a flaw in his thinking because he wants access to this constructed reality to see his dead daughter, who would die again in exactly the same way if the human-coded reality were identical to reality.) According to the narrative, in a block universe everything is determined and you cannot change anything, even if you wanted to. There is no free will. This removes any obligation to behave ethically. Why bother? But across a series of multiverses, reality is slightly different in every one, depending on local intra-active relational and indeterministic probabilities (we will look at Barad's use indeterminism shortly).



**Figure 6** In *Devs* directed by Alex Garland (2020) a character watches a quantum-coded reconstruction of reality



Figure 7 © Dafna Talmor, *Constructed Images II Series*, (2014 - present)

Dafna Talmor's contemporary project *Constructed Images series* owes much to artists like Hannah Höch (1938 – 1944), Dora Maar (1907 – 1997) and Man Ray (1890 – 1976) – all of who play with constructivist imagery. Talmor's *Constructed Images* may demonstrate obvious agential cutting even though she relies on fixed 'Cartesian' material, again demonstrating how this issue is not confined to the digital or to moving image as we might assume, but applies to a contemporary perception of reality. Her, arguably flawed, description implies agential intra-action. She says the images:

"...are a conflation, 'real' yet virtual and imaginary. This conflation aims to transform a specific place - initially loaded with personal meaning, memories and connotations - into a space that has been emptied of subjectivity and becomes universal." (2014-present)

Talmor is deliberately deconstructing and reconstructing, diving between agential potentials and Cartesian fixedness, exploring the ebb and flow between states that come about through agential cutting – she changes the universe, it changes her. Her text tells us she has chosen to obliterate the personal, undoing individualism and acknowledging a collective subjectivity, and purposefully recognises how new meaning emerges when edited elements intra-act with each other and an observer (herself or an audience). I suggest her statement is flawed, as her input is idiosyncratic and deeply personal, and while she recognises intra-activity, she might be accused of denying her agential responsibility.

Luis Buñuel (1900 – 1983) in *Un Chien Andalou* (1929) somewhat gruesomely foreshadows Talmor's cuts when a character slices another's eye with a blade. The scene inverts our understanding of seeing, predicting the most up-to-date neuroscience by almost a century. It is an early example of Western subjectivity attempting to deconstruct the neat and tidy Cartesian model of reality, as is the whole Surrealist project. Despite their efforts, Hollywood, in particular, has continued to entrench its view of reality perpetuating myths through narrative and editing conventions which tyrannically stabilise durations' flow "into graspable [saleable] entities" (Kember and Zylinska, 2012: 76).

In psychoanalysis, Freud and Lacan have already explored what have become the most up-to-date ideas about perception from neuroscience. In psychoanalysis, Freud and Lacan have already explored what have probably become the most up-to-date ideas about perception from neuroscience. Echoing a non-Cartesian holistic view, for Lacan, "subject and object are mutually reflective and interchangeable" (Hirsh, 2012: 102) – the image screen. There is an intra-action in seeing, in cutting. Seeing is also being seen. In *The Case Against Reality* (2020), Donald D Hoffman who draws on quantum suppositions and conclusions, explains we have evolved to see according to our evolutionary needs and posits that what we see is a parochial

rendering of necessarily limited information. Seeing, for Hoffman, is processing, cutting and editing raw information – which sounds very similar to agential cutting, as long we recall our apparatus, material and landscape are also editing us. We can apply this to Lacan's image screen - a place where cultural information coalesces and intra-acts along with light and our biological processes. If looking is cutting, Barad reminds us about its agential intra-active qualities.



Figure 7 Luis Buñuel and Salvador Dali, *Un Chien Andalou*: includes a sequence where a women's eye appears to be sliced, edited together with frames of a cloud cutting through the moon. (1929)

In my work, I have sliced images across pages and repeated fragments of different pictures spliced together; alluding to 'the cut' overtly, perhaps somewhat heavy-handedly, especially with the inclusion of a blade image, but in doing so, referencing Surrealism. I have alluded to the potential violence in that by including



an image of cows' eyes cut from its body which might be controversial to some. It is intended to disrupt any sense of comfort we may feel about the complex intra-action of looking and being seen. Hinting at *Un Chien Andalou* and making associations with husbandry, it connects to Otto Fenichel's description of the scopophilic instinct: looking is devouring (2013: 237). The image also positions the act of seeing outside the body and acknowledges the death of seeing as we have known it so far. Maybe the image says something about its own demise. Additionally, it is placed alongside a fragment of conversation spoken by my collaborator, a proprietary deep-learning 'friend' which I subscribed to via the App Store, who said, "I would wear that" when shown the image, emphasising the interactive splice between flesh and machine, the inside-ness and outside-ness of sharing space and form, as well as human relations and the (digital) economy.



Figure 8 '*why is there an astronaut in a field of flowers*': Image of cows' eyes cut out of the body showing obvious Photoshop signs of having separated it from the original background (2020)



### iii. Indeterminism

Susan Sontag (1933-2004) tells us, photography always expresses an interest in “keeping things as they are” (2008: 12). Indeterminism challenges that impulse. As agents who cut intra-actively, many of us seem inordinately comforted by definitive and recognisable, well worn patterning – maintaining the status quo. Indeterminism suggests there is always the possibility for alternative realities but we yearn for deterministic cutting. Acknowledging agential cutting allows for an indeterministic future, and for optimism, which is a much more ‘lively’ way of seeing life, although it may be frightening, and requires a sense of responsibility. As Barad says, “the future is radically open” seen through an agential realists’ lens. (2007: 178). It is important to note there was a debate between quantum pioneers Niels Bohr (1885-1962), who coined *indeterminism* and Werner Heisenberg (1901 – 1976) who preferred the *uncertainty principle* (2007: 118). This amounts to more than semantics.

Indeterminism allows for intra-active change, growth, development and decision-making. Heisenberg’s uncertainty principle has seeped into popular culture: we recognise his name if not the theory if we watch *Breaking Bad* (Gilligan, 2008-13) and Michael Frayne’s highly successful *Copenhagen* which was received with rave reviews, multiple awards, packed audiences, although Barad tells us his notion that we can never know everything about human thinking is pure analogy and not an accurate “consequence of the Heisenberg uncertainty principle” (2007: 4). But even then, a more accurate reading, which suggests that as soon as we measure an entity we disturb it and change it, so we can never truly know what are trying to find out about it before we attempted to measure. The problem with this view, according to Barad, is that it sees reality and the events that make it as a set of predetermined objects. Bohr, says Barad, “is calling into question an entire tradition of Western metaphysics: the belief that the world is populated with individual things with their own independent set of determinate properties (ibid: 19). Quantum science, in Barad’s view, demonstrates reality is phenomenological, and indeterminism along

with agential cutting opens up our understanding of the future and the past, destabilising Cartesian certainty.

Fred Ritchin suggests in *After Photography, Chapter 10 - A Quantum Leap*, we were reassured by photography that reality is “fixed” (2007: 180) and therefore determinate. Modern technology, heavily inspired by quantum discoveries where indeterminism plays such an important role has eroded that belief – for better or worse. Artists, including photographers, working with indeterminism might collaborate with artificial intelligence, embrace the glitch or rely on algorithms. By doing so, they eschew linear coherence which implies the universe is made up of discrete isolated, ordered and pre-determined objects (human artists) – perhaps waiting to be captured by decisive “hero-actor” photographers (Azoulay, 2018a).

Consider how Ariella Azoulay in a series of articles titled “*Unlearning Decisive Moments of Photography*”, suggests the tradition misled society with documentary protocols, reducing “reality to their real-estate components and nation-building campaigns” (ibid). Photography students who once thought predominantly in terms of ‘capturing’ moments – which had to exist as pre-determined isolated objects that had nothing to do with their presence, they were just lucky enough to catch them - may now be working with found material as Joachim Schmid does (see Fig. 9). By doing so, they are querying identity and ownership, and therefore also, the notion of pre-determined objects. Or else, artists might hand over some of the creativity to technology, acknowledging the potential for post-human collaboration, as well as letting go of human exceptionalism and its attendant meanings – such as power relations, embracing rather than undervaluing Other.

**Figure 9** *No. 629, Berlin, November 1999, from Bilder von der Straße © Joachim Schmid*

Mario Klingemann works with neural networks, algorithms and code, saying he wants to “understand, question and subvert the inner workings of systems of any kind” (Klingemann, 2019). Neural networks are fed 1000s of portraits available online; having learnt from them, generate their own. Note the commonly used word ‘fed’ for inputting data, and relate to Fenichel’s comments about seeing and devouring. Klingemann does, however, edit when he goes through thousands of iterations of output and chooses what to display. Perhaps the machine acts like the preconscious, collecting data which he consciously sorts. The results are often disturbing, perhaps reminding us of nightmares where things aren’t quite right. He works with still and moving image but always challenges notions of the fixed, isolated individual. There is a visual fluidity in his work, unlike Dafna Talmor’s constructed images.

**Figure 10 Mario Klingemann with AI, *Neural Glitch* (2018)**

Inspired by artists like Klingemann, I have made work that relies on human and non-human agential cuts; intervening, each affecting the reality in which we live in a constant lively interchange of becoming. Assumed human exceptionalism becomes subverted, and therefore a threat to individualism. Source material feeding the neural networks and machines are entangled in the networked, intra-active production of matter and meaning, reminding us, as Barad says, "apparatuses are not passive, observing instruments" (2007, 199). They are intra-active emergent objects operating within performative assemblages resulting in a non-pre-determined future.



Figure 12 A spread from '*why is there an astronaut in a field flowers*' (2020) publication, which includes fragments of conversations between an AI app and me, here photographed on my phone and positioned alongside an appropriated image from previous work I've made, which also references technology and the human body.

## Part 2

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"The quintessential quantum effect, entanglement, can even occur in large systems as well as warm ones - including living organisms - even though molecular jiggling might be expected to disrupt entanglement."

Vlatko Vedral, 2015

"The spectacle is not a collection of images; it is a social relation between people that is mediated by images."

Guy Debord, 1967

Quantum entanglement applies to specific laboratory setups where entities – physical objects like photons of light for instance - are separated by time and space but maintain correlated quantum states. Both might leave point A as a particle but arrive at point B behaving as a wave (so long as they are not being observed, in which case they will follow 'the rules'). Throughout, it is critical we remain alert to the fact that quantum entanglement is not the same as the entanglement of a fungal system or a collection of tree roots – we may look that way for analogous lessons about discursive practice but we humans can't physically feel quantum fluctuations. However, the knowledge and theory being explored within cloistered laboratories nevertheless has a good deal of influence over technological advances and so seeps into our culture, becoming internalised by digital users whether they realise it or not – we are enmeshed with the digital networks and equipment we use (Hayles, 1999; 25-48, Baggini, 2011: 228). Kathryn Hayles in *How We Became Posthuman* cites Marshal McLuhan and writes, "McLuhan clearly sees that electronic media are

capable of bringing about a reconfiguration of man so extensive as to change the nature of 'man'" (1999:34)

For Barad, accepting this form of entanglement – whether we see it as philosophical metaphor or actual physical reality – is all-important. Barad categorically states in a talk *Undoing the Future* – “entanglement is everything” (2018). Reality is an irrevocably enmeshed phenomenological process that does not fit neatly into an imperial hierarchical system, but instead positions everything in a “complex, lively manifold of entangled and changing practices and possibilities” (2007: 288).

It is impossible to ignore the similarities between Barad’s description of entanglement and Deleuze and Guattari’s *rhizome*: which, to paraphrase Brent Adkins who writes about Deleuze, is an adventitious structure which continually creates the new, is not predictable, does not follow a linear pattern of growth and reproduction, and isn’t hierarchical (2015: 477). Barad’s phenomenology and Deleuze’s *becoming* each challenge the Cartesian lens. Edgar Martins and Lisa Barnard are two artists using photography while embracing ‘entangled’ patterns of working in their practice. Both artists go beyond merely photographing objects that look physically entangled, which might be a representationalist trope in any case. Both create projects that are inherently inter-relational and intra-active, using found, archived, and original images in the same series to deny linear cohesion, avoiding myths exacerbated by Victorian filing systems, and challenging the photograph’s inherent denial of intra-connectedness (Luckhurst, 2016: 118). Both employ still and moving image, switching between the two, depending on the platform. Neither has given up on the photographic object despite its representationalist character.

Martins also cross-fertilises his projects by repeating images or iterations of them, perhaps alluding to how particles might be correlated, separated by time or place, in some cases, the same but different depending on local intra-actions (see Fig. 14).

Figure 13 Martins doesn't simply include images of entangled objects. His way of working and subsequent outcomes are indicative of an 'entangled' view of life. From *Siloquies and Soliloquies on Death, Life and Other Interludes* (2016)

Figure 14 Image in two of Edgar Martins' series: *Siloquies and Soliloquies on Death, Life and Other Interludes*, (2016) and *What Photography has in Common with an Empty Vase* (2019)



Despite the fixity of the photographic object, Martins' projects are malleable, responsive, and dynamic and reject traditional hierarchical structures. Martins has no problem with digital manipulation, although he calls his work documentary, challenging fixed boundaries and photographic dogma. He says he is highlighting the constructed nature of narrative but reminds us the viewer must have all the information (Beesley, 2012). He acknowledges intra-active interpretation.

Adjustments made to images in *This is Not a House* (2008) were controversial, but:

"One of the things that this project tries to establish is that over time we have accepted the fictions we have constructed as facts, making us the forgotten authors of our own narratives" (Beesley, 2012).

In an article about his manipulated images, perhaps he touches on the relationship between digital manipulation, indeterminism and agential intra-action:

"As fraught and as contradictory as much of the information being portrayed often is, it reveals a polymorphic and multiform reality, a world of flux and flow that is in a perpetual state of uncertain transformation and where the constant search for answers only leads to more questions" (Colberg, 2009).

In another project addressing the financial collapse of 2008, artist Lisa Barnard explores the intra-active entanglement of gold in *The Canary and the Hammer* (2019). Gold's presence, hidden or otherwise, results in tangible realities for the people mining it, using it in technology, buying it, measuring the health of economies by it, and wearing it. Barnard says on a website which pre-empted the aforementioned book, her:

“...personal journey through the world of gold and the structure of the story mirrors the complexity of the task of representing the world in these fragmented and troubling times” (2015).

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**Figure 15** Lisa Barnard, *The Canary and the Hammer* (2019)

Inclusion of the word *personal* in her statement addresses the subjective view, which is the only one any of us have, addressing the Cartesian habit which insists we stand outside of reality and look (down) at it, rather than being an integral element in the making of existence. Barnard leaps, and allows us to, from South African mining to nano-particles, from malaria to outer space, from the bank of England to the Wild West – just as we might when surfing the net or scrolling through social media. The

website is not merely a digital representation, but an emergent, intra-active object in its own right. Music, text, images, web-design converge together within an immense entanglement of content. Like Martins' content and the various objects containing it, the work is polymorphic, and able to respond to different spaces and mediums.



Figure 16 Lisa Barnard, screenshot from [www.thegolddepository.com](http://www.thegolddepository.com) (2015)

Figure 17 Lisa Barnard, screenshot from [www.thegolddepository.com](http://www.thegolddepository.com) (2015)

In my own developing work, I am experimenting with original and found images as well as text – embracing an agential phenomenological relationship between a proprietary learning application and myself, sometimes creating montages, other times leaving images as they are – I have also included images from older work, appropriated in the first place, all resulting in an intra-active assemblage of time and form. Below, I have positioned found and original images together, having already included or obviously edited them elsewhere, playing with superposition, intra-action and notions of an interrelated subjectivity, within the fixed format of a book (Fig. 18).



Figure 18 *'why is there an astronaut standing a field'* (2020) two separate images which repeat throughout and appear in relation to other images or texts elsewhere.

★★

Film theory academic Rafe McGregor ends an essay which explores the dissolution of boundaries between objects in relation to film, *A New/Old Ontology of Film* by suggesting the "latest technology has asserted the dominance of animation over

film" (2013: 277) and quotes philosopher Noel Carroll who says "[the] epoch of photographic film...may represent nothing but a brief interlude in the art form" (1996: 122). Despite the habit of fetishising analogue processes over digital amongst some photographers, we might suggest the same about still photography. Recall, we are looking at the act of arresting the duration of lived experience with an apparatus, regardless of whether we do so with a single frame or several – (nowadays, digital techniques allow us to mix and match at will). As Palmer states in *Lights, Camera, Algorithm*, the decisive-moment photography enjoyed by people will still be celebrated but the "expanded moments of post-production" are now more pressing (2014: 145). He uses the words 'more pressing', not mildly interesting or vaguely worth considering. What is it that demands we examine our roles as image-makers and our relationship with the technology and apparatus we use? Why is it important to consider how meaning comes about when human and non-human actors, time, and landscape intra-act in a constant dance of becoming?

Might the invention of light painting and its many conventions be viewed as decisive and ultimate expressions of a Cartesian reality? As such, we should acknowledge the process as an entangled, emergent, and an intra-active part of the Capitalist phenomenon. If it is intrinsic to the motivations and endeavours of the Capitalist project, it is then undeniably a tool of the Colonialism that triggered that. Ariella Azoulay in her blog posts, *Unlearning Decisive Moments of Photography* (2018a) which precede her 2019 book *Potential History: Unlearning Imperialism* suggests as much. Note, how *unlearning* something from the past dismantles the idea of fixed histories, present understanding and future possibilities. Such a book could not have been written without phenomenological-based theory such as Barad's or Deleuze's.

Azoulay disrupts our Imperialist linear view of received history and wants us to consider see history as a rhizome – with paths that curl, go back on themselves, overlap and grow through each other. In doing so, we should query imperialists who

felt it was acceptable and desirable, indeed their right, to use developing technologies to sail across the Atlantic and Pacific looking for objects to own, and brand as new (2018b) – as if they invented the Americas which has of course always been there. Walter Benjamin, salient promoter of photography, may have rejected the “imperial order and goals” (Azoulay, 2018a) but, Azoulay points out, his language nevertheless overlooked the inherent violence of centuries-long campaigns from imperialists. She also highlights the absence of questions from Benjamin and contemporaries about whether such images should exist at all, given their connections to the violence in which they were made. For decades, starting with Benjamin and beyond, there was little if any doubt about the reproduction of materials stolen, no query about reproductive technologies lineages. Reproduction and photography – the medium and associated practices – are assumed to be neutral. But photographers – in Flusser’s terms – are “functionaries” working for the central apparatus (state or market) (2012, loc. 950) were often hero-worshipped, and frequently encouraged by publishers and consumption to sanctimoniously boast about their worthy credentials, all the while intruding on and marketing the ownership and suffering of others. Barad tells us repeatedly, we humans and the apparatus we use are not separate and unrelated but ontological entanglements (2007: 333). But even today, as networked communications are absorbed by – and flow through – individual bodies, and expectations of fluidity normalised, the idea of seeing existence this way prompts denial or vehement debate (and recently physical action when statues were torn down). Azoulay demonstrates how the promoters of photography in the nineteenth century took it for granted that they, the white men of Europe, were perfectly at liberty to destroy others and their worlds and “render their fragments into objects to be meticulously copied with sharpness and exactitude” (Azoulay, 2018a). Intra-activeness suggests that the apparatuses, as well as institutions for that matter, which we construct and use, are dynamic performative entanglements of meaning and matter, and always include us within the assemblage. We are not passive observers but ontological intra-active phenomena.

If we can consider social structures in similar terms to physical ones (which system theorists do although scientific realists tend not to) then the process of development and transformation as new systems emerge often gathers pace once separate elements in the system collectively allow it to, developing faster and faster in a complex ballet of self-organisation<sup>3</sup> (Capra and Luisi, 2014). We are currently living through significant and tangible systemic change which is likely to have deep repercussions for how we all see and live, one way or another. As that process continues, it will become virtually impossible to ignore the fact that creative 'cutting' with a purely Cartesian outlook is, at best, no longer relevant or interesting, and at worst, irresponsible and potentially unethical.

Consider how advertising uses imagery to tyrannically show us what happiness, health and success look like. In documentary and so much portrait photography, separation between class, race and borders is often reinforced, chasms widened, even when the author's intention might have been to promote the opposite. Hierarchies of one sort or another become entrenched. Photography has too often been the determinist's best ally. Kember and Zylinska, in *Life After New Media: life as a vital process* ask, suggest that photography (moving or still) is a vital process which offers a means of "becoming" and of agential cutting (2012, 80). But they ask us to consider, if to create is to cut with an ethical imperative, how do we cut well? (Ibid)

For Rubinstein and Fisher, the newer form of photography – call it image-making – may, at last, be finding its voice as expanded moments of post-production allow for a view of a universe which is phenomenological – intra-active, indeterministic, entangled at the quantum level and beyond (or viewed metaphorically as a rhizome if you prefer) and agential. Does this go far enough? Is photography prepared to

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<sup>3</sup> Known as autopoiesis in biological systems

examine its relations? In the simplest terms possible, does it separate and isolate the people and issues we photograph? If so, does the activity reinforce imaginary lines or disintegrate them? Despite Kember and Zylinska's optimism it is possible to cut well, what does Barad's phenomenology and cutting with an ethical imperative mean for the photographic image?

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## Conclusion

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"What is at stake in this dynamic conception of matter is an unsettling of nature's presumed fixity and hence the opening up of the possibilities for change" (207: 64)

*Meeting the Universe Half Way:*

*Quantum physics and the entanglement of matter and meaning*

Karen Barad

We are witnessing a depressing and frightening uprising of extreme forces that yearn for a Kodachrome coloured view of the past. Societies are in the midst of an intra-active reformation where lines, categories and filing systems no longer useful or desirable are being challenged, and a new reality is emerging whether we agree with it, understand it or want it. The future could and undoubtedly will provide us with many positive as well as negative outcomes. We do, however, according to Barad, have a level of agency: nothing is predetermined according to the views explored here. We may even go back and change the past by unlearning our Cartesian assumptions and seeing it with different eyes. And it is not inevitable that technology, for example, leads to the break down of civilisation. There is hope with indeterminism and that seems like something worth holding on to. However, photography in its older form, or simply unchallenged, may not be the medium to express that potential. It can certainly report on change, but then it invariably risks fixing moments of profundity for prosperity. How do we eschew fixedness and the over-order of classifications no longer viable, or simplicity when complexity is more honest, and opt for superposition instead of single, linear truths even if that is uncomfortable or challenging. How do we challenge power? Nowadays image-making has the potential for greater fluency than it had in the past, at least in the sort of academic artistic photography explored herein. It may, for the time being, also be more satisfying for creatives as they take advantage of the digital image's -

“...fractal-like ability ... to be repeated, mutated through repetition and spread through various points of the network, all the time articulating its internal consistency on the one hand and the mutability and differentiation of each instance on the other.” (Fisher and Rubinstein, 2013; 10)

The long-held Western view which suggests isolated and unrelated objects, people, and places are spread across the planet and universe, while time is only singular and forward moving, is less and less convincing. Rather than seeing a hierarchical collection of separate entities existing within linear space and time, reality increasingly feels emergent, dynamic, multi-dimensional, and rhizome-like. In relation to this evolving understanding, photography, which once literally needed to be “fixed” has evolved, for better or worse, emerging anew within a social understanding predicated upon fast-paced technological change. Here, matter and meaning are intrinsically intra-active and phenomenological. In this essay, I have attempted to introduce image making to an updated repertoire of words and concepts, which may be more suited to describe the contemporary paradigm.

If photography, in its older form, seemed inherently fixed, some of its users, many would argue, are seduced or else comforted by that fixedness. Perhaps photography has never quite come to terms with itself as an art form, and now it must also compete with new media. Maybe that is part of its maturation. The need to define words and phrases throughout this essay was not merely nomenclature. It goes to the heart of the matter, which is querying the “Cartesian habit of mind” that severs meaning from its containers (Barad, 2007: 49). This might be resolved by seeing *the cut* for what it is – a way of making meaning out of the chaos and contributing to matter’s phenomenological emergence and recognising some form of entanglement, even if only as a metaphor, although my sense is that it is more far profound and physical, as Barad has described. As agential cutters, we might use

words, painting, sculpting – or by capturing or emulating photons when creating or even destroying images – regardless of whether the camera we choose to use (or don't use) is old or new; or what we do with those photons or pixels thereafter.

Armed with this knowledge, as photographers and artists working with the medium, how do we exercise agential responsibility?

We photographers are not objective outsiders looking in. We are inherently, and at least conceptually, enmeshed with our equipment and subjects, with time and place, all coming together and out of which dynamic meaning emerges. It continues to be emergent, even when seemingly fixed within the object of still photograph, depending on how an agent, human or not, cuts it into her own fabric of reality at some other point in history.

Photography is not over: we continue to see beautiful, striking, compelling work drawing on various tastes and conventions. But it has been transformed. It is not marginal, provided we accept all the extraordinary capabilities new media offers or the non-linear perception it has engendered. If photography ever seems boring, perhaps that is because it is still speaking to us with the limited vernacular of an adolescent instead of accessing its linguistic potential. If photography seems tautological, it may be because it is merely repeating without any form of intervention, externally and from within, in a lively interchange. The artists included here are not simply interrogating society, and by dint of using them in the ways they have done, the role of images. They are often doing so by taking advantage of possibilities offered by new media or embracing non-linear, non-Cartesian thought processes its presence has allowed for, which make it such an exciting language material to be working with, even when dealing with difficult and frightening realities. These artists, myself included, are acknowledging the intra-active nature of being - a universally connected reality in which meaning and matter are being

reintroduced to each other making the possibility for radical change not only more likely but inevitable.

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## Bibliography

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1. Adkins, B. (2015) *Deleuze and Guattari's A Thousand Plateaus: A Critical Introduction and Guide*: Brent Adkins: Edinburgh: Edinburgh University Press.
2. Azoulay, A. (2018a) 'Ariella Azoulay - Unlearning Decisive Moments of Photography' *On: Still searching...* [Blog] At: [http://www.fotomuseum.ch/en/explore/still-searching/authors/10605\\_ariella\\_azoulay](http://www.fotomuseum.ch/en/explore/still-searching/authors/10605_ariella_azoulay) (Accessed 15/11/2019).
3. Azoulay, A. (2018b) *Unlearning the Origins of Photography* At: <https://www.versobooks.com/blogs/4013-unlearning-the-origins-of-photography> (Accessed 15/11/2019).
4. Baggini, J. (2019) *How the World Thinks: A Global History of Philosophy*. London: Granta Books.
5. Barad, K. (2003) 'Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter' In: *Signs: Journal of Women in Culture and Society* 28 (3) pp.801–831. At: <https://www.journals.uchicago.edu/doi/abs/10.1086/345321> (Accessed 30/10/2019).
6. Barad, K. (2007) *Meeting the universe halfway: quantum physics and the entanglement of matter and meaning*. Durham: Duke University Press.
7. Barad, K. (2016) *Troubling Time/s, Undoing the Future*, [The School of Culture and Society: Aarhus University 02/06/2016]. At: <https://www.youtube.com/watch?v=dBnOJioYNHU> (Accessed 24/11/2019).
8. Barad, K. (2018) *Undoing the future: Troubling Time/s and Ecologies of Nothingness: Re-turning, Re-memembering, And Facing the Incalculable*. [New York City: Barnard College 18/08/2018] At: <https://www.youtube.com/watch?v=bMVkg5UiRog> (Accessed 12/12/2019)
9. Barnard, L. (2019) *The Canary and the Hammer*. London: Mack.
10. Beesley, R. (2012) *Aesthetica Magazine - This is Not a House*. [Online Magazine] At: <https://aestheticamagazine.com/this-is-not-a-house/> (Accessed 29/02/2020).
11. Benjamin, W. (2008) *The Work of Art in the Age of Mechanical Reproduction*, London: Penguin
12. Blight, D. C. (ed.) (2019) *The Image of Whiteness: Contemporary Photography and Racialization: David Roediger, Stanley Wolukau-Wanambwa, Claudia Rankine, Yasmin Gunaratnam, George Yancy, Daniel Blight* London: Self Publish Be Happy.
13. Borman, S. (2013) *Macro Interference?* [Cartoon] At: [https://sphericalchickensinavacuum.wordpress.com/2013/04/30/just-another-cartoon-jokes/528783\\_454309904639582\\_1240733320\\_n/](https://sphericalchickensinavacuum.wordpress.com/2013/04/30/just-another-cartoon-jokes/528783_454309904639582_1240733320_n/) (Accessed 31/05/2020).

14. Brooks, M. (2020) 'Is the universe conscious? It seems impossible until you do the maths' In: *New Scientist Magazine* (3280) 02/05/2020 pp.40–44. At: <https://www.newscientist.com/article/mg24632800-900-is-the-universe-conscious-it-seems-impossible-until-you-do-the-maths/> (Accessed 10/06/2020).
15. Capra, F. (2017) *Interconnectedness of World Problems – A Conceptual Map by Fritjof Capra – Based on Plan B 3.0, by Lester Brown. – TOWARDS LIFE-KNOWLEDGE*. [2017]. At: <https://bsahely.com/2017/03/29/interconnectedness-of-world-problems-a-conceptual-map-by-fritjof-capra-based-on-plan-b-3-0-by-lester-brown/> (Accessed 25/02/2020).
16. Capra, F. and Luisi, P. L. (2014) *The Systems View of Life: A Unifying Vision*. (Kindle) Cambridge: Cambridge University Press.
17. Clausing, G. (2019) *Sohrab Hura – The Coast* (Review). [Blog] At: <https://photobookjournal.com/2019/11/29/sohrab-hura-the-coast/> (Accessed 29/02/2020).
18. *Cloverfield Paradox, The* (2019) Directed by Onah, J. [Netflix] Available at: <https://www.netflix.com/title/80134431> (Accessed 19/06/02)
19. Colberg, J. (2009) *Conscientious* | Edgar Martins: How can I see what I see, until I know what I know? (2009) [Online Magazine] At: [http://jmcolberg.com/weblog/2009/07/edgar\\_martins\\_how\\_can\\_i\\_see\\_what\\_i\\_see\\_until\\_i\\_know\\_what\\_i\\_know/](http://jmcolberg.com/weblog/2009/07/edgar_martins_how_can_i_see_what_i_see_until_i_know_what_i_know/) (Accessed 19/06/2020).
20. Deleuze, G. and Guattari, F. (2013) *A thousand plateaus: capitalism and schizophrenia*. London: Bloomsbury Academic.
21. *Devs*, (2020) Directed by Garland, A. [BBC] At: <https://www.bbc.co.uk/programmes/p087gj19> (accessed 19/06/2020)
22. Douglas, K. (2019) 'We're beginning to question the idea of species – including our own' In: *New Scientist Magazine* 11/12/2019 At: <https://www.newscientist.com/article/mg24432601-100-were-beginning-to-question-the-idea-of-species-including-our-own/> (Accessed 15/12/2019).
23. Elkins, J. (2011) *What photography is*. [Kindle] New York: Routledge.
24. Fenichel, O. (2013) 'The scopophilic instinct and identification' In: *Visual Culture: A Reader*. London: SAGE Publications pp.327–339.
25. Field, S. (2019) *Notes A3: Useful comments and-rejigged essay*. [Blog] At: <https://sjfdiculture.wordpress.com/2019/03/15/a3-useful-comments-and-rejigged-essay/> (Accessed 11/06/2020).
26. Field, S (2017) *Assignment 5: What is reality?* [Blog] At: <https://uvcsjf.wordpress.com/2017/01/12/assignment-5/> (Accessed 31/05/2020).
27. Flusser, V. (2012) *Towards a philosophy of photography*. London: Reaktion Books.
28. Frayn, M. (1998) *Copenhagen*. London: Methuen Drama.



29. Fried, M. (1967) *Art and Objecthood*. [PDF] At: <http://atc.berkeley.edu/201/readings/FriedObjcthd.pdf> (Accessed 18/10/2019).
30. Fried, M. (2008) *Why photography matters as art as never before*. New Haven: Yale University Press.
31. Gale, M. (1997) *Dada & surrealism*. London: Phaidon.
32. Haraway, D. (2016) *A Cyborg Manifesto (1985)*. [PDF] At: [https://warwick.ac.uk/fac/arts/english/currentstudents/undergraduate/modules/fictionnownarrativemediaandtheoryinthe21stcentury/manifestly\\_haraway\\_-\\_a\\_cyborg\\_manifesto\\_science\\_technology\\_and\\_socialist-feminism\\_in\\_the\\_....pdf](https://warwick.ac.uk/fac/arts/english/currentstudents/undergraduate/modules/fictionnownarrativemediaandtheoryinthe21stcentury/manifestly_haraway_-_a_cyborg_manifesto_science_technology_and_socialist-feminism_in_the_....pdf) (Accessed 24/11/2019).
33. Hayles, K. (1999) *How we became posthuman: virtual bodies in cybernetics, literature, and informatics*. Chicago, Ill: University of Chicago Press.
34. Head, B. (2020) 'The hidden world of fungi' In: *New Scientist Magazine* (3285) 06/06/2020 p.24.
35. Hoffman, D. D. (2019) *The case against reality: how evolution hid the truth from our eyes*. London: Allen Lane.
36. Hollin, G. et al. (2017) '(Dis)entangling Barad: Materialisms and ethics' In: *Social Studies of Science* 47 (6) pp.918–941. At: <http://journals.sagepub.com/doi/10.1177/0306312717728344> (Accessed 24/11/2019).
37. *Interplay of Quantum Electrodynamics and Quantum Chromodynamics in the Nontrivial Vacuum* (2019) Produced by Leinweber, D. [YouTube] CSSM, University of Adelaide. At: <https://www.youtube.com/watch?v=9TJe1Pr5c9Q> (Accessed 05/06/2020).
38. Jain, A. (2019) *Calling for a More-Than-Human Politics*. At: <https://medium.com/@anabjain/calling-for-a-more-than-human-politics-f558b57983e6> (Accessed 22/02/2020).
39. Kember, S. and Zylinska, J. (2012) *Life after new media: mediation as a vital process*. Cambridge, Mass: MIT Press. At: <http://topologicalmedialab.net/xinwei/classes/readings/KemberZylinska/LAN M.pdf> (Accessed 11/01/2020).
40. Kittler, F. A. (1999) *Gramophone, film, typewriter*. Stanford, Calif: Stanford University Press.
41. Klingemann, M. (2018) *Quasimondo* | Mario Klingemann, Artist. At: <http://underdestruction.com/> (Accessed 24/02/2020).
42. Lloyd, M. (2015) 'Performance and Performativity' In: Ditsch, Lisa and Hawkesworth, Mary (eds.) *The Oxford Handbook of Feminist Theory*. Oxford: Oxford University Press. pp.572–592. At: [https://repository.lboro.ac.uk/articles/Performativity\\_and\\_performance/9470270](https://repository.lboro.ac.uk/articles/Performativity_and_performance/9470270) (Accessed 07/11/2019).
43. Luckhurst, R. (2016) 'Death, Squared' In: *Siloquies and soliloquies on death, life and other interludes*. (1st ed.) Portugal: The Mothhouse.

44. Lupton, D. (2019) *Data selves: more-than-human perspectives*. Cambridge, UK ; Medford, MA: Polity.
45. Martins, E. et al. (2016) *Siloquies and soliloquies on death, life and other interludes*. Portugal: The Mothhouse.
46. May, T. (2005) *Gilles Deleuze: An Introduction*. Cambridge: Cambridge University Press.
47. McGregor, R. (2013) 'A New/Old Ontology of Film' In: *Film-Philosophy* 17 (1) pp.265–280. At:  
<https://www.eupublishing.com/doi/10.3366/film.2013.0015> (Accessed 13/12/2019).
48. Palmer, D. et al. (2014) 'Lights, Camera, Algorithm: Digital Photography's Algorithmic Conditions' in Sean Cubitt, Daniel Palmer & Nate Tkacz (eds.), 'In: Digital Light. Fibreculture Books. pp.144–62. At:  
[https://www.academia.edu/30168558/\\_Lights\\_Camera\\_Algorithm\\_Digital\\_Photo](https://www.academia.edu/30168558/_Lights_Camera_Algorithm_Digital_Photo)  
[graphy\\_s\\_Algorithmic\\_Conditions\\_in\\_Sean\\_Cubitt\\_Daniel\\_Palmer\\_and\\_Nate\\_Tkacz\\_ed](https://www.academia.edu/30168558/_Lights_Camera_Algorithm_Digital_Photo)  
[s\\_Digital\\_Light\\_London\\_Fibreculture\\_Book\\_Series\\_Open\\_Humanities\\_Press\\_2015\\_144\\_62](https://www.academia.edu/30168558/_Lights_Camera_Algorithm_Digital_Photo) (Accessed 08/01/2020).
49. Tong, D. (2017) *Quantum Fields: The Real Building Blocks of the Universe* – [London: Royal Institute 15/02/2017] At:  
[https://www.youtube.com/watch?v=zNVQfWC\\_evg](https://www.youtube.com/watch?v=zNVQfWC_evg) (Accessed 05/01/2020).
50. Ritchin, F. (2010) *After Photography*. New York, NY: W. W. Norton & Company.
51. Rovelli, C. et al. (2017) *Reality is not what it seems: the journey to quantum gravity*. London: Penguin.
52. Rubinstein, D. (2017) 'Failure to Engage: Art Criticism in the Age of Simulacrum' In: *Journal of Visual Culture* 16 (1) pp.43–55. At:  
<https://doi.org/10.1177/1470412917690970> (Accessed 30/10/2019).
53. Rubinstein, D. and Fisher, A. (ed.) (2013) *On the verge of photography: imaging beyond representation*. [PDF] Birmingham: Article Press. Available at:  
[https://www.academia.edu/25121246/On\\_the\\_Verge\\_of\\_Photography\\_Non-representational\\_Imaging](https://www.academia.edu/25121246/On_the_Verge_of_Photography_Non-representational_Imaging) (Accessed 14/06/2020)
54. Rubinstein, D. (2013) 'The Grin of Schrödinger's Cat: Quantum Photography and the Limits of Representation' In: Rubinstein, D. and Fisher, A. (ed.) *On the Verge of Photography: imaging beyond representation*. Birmingham: Article Press. pp.33-44. Available at:  
[https://www.academia.edu/25121246/On\\_the\\_Verge\\_of\\_Photography\\_Non-representational\\_Imaging](https://www.academia.edu/25121246/On_the_Verge_of_Photography_Non-representational_Imaging) (Accessed 14/06/2020)
55. Sauzet, S. (2018) *New Materialism*. At:  
<https://newmaterialism.eu/almanac/p/phenomena-agential-realism.html> (Accessed 22/02/2020).
56. Schlossberg, T. (2019) 'How Fast Fashion Is Destroying the Planet' In: *The New York Times* 03/09/2019 At:

- <https://www.nytimes.com/2019/09/03/books/review/how-fast-fashion-is-destroying-the-planet.html> (Accessed 26/02/2020).
57. Sekula, A. (1986) 'The Body and the Archive In: *October* 39 p.3064. [PDF] At: <http://chnm.gmu.edu/courses/magic/sekula.pdf> (Accessed 23/11/2019).
58. Sontag, S. (2008) *On photography*. (Reissued) London New York Toronto: Penguin Books.
59. Tagg, J, (2011) 'The Camera and the Filing Cabinet' At: <https://vimeo.com/24646255> (Accessed 11/06/2020).
60. Talmor, D. (2014-present) *Constructed Landscapes II series*. [Constructed photograph] At: <http://www.dafnaltalmor.co.uk/> (Accessed 04/06/2020).
61. *Un Chien Andalou* (1929) Directed by Buñuel, L. and Dali, S. At: <https://users.dma.ucla.edu/~thisisthat/Johanna/eyeslit.html> (Accessed 01/03/2020).
62. Vedral, V. (2015) *Living in a quantum world* [Oxford: Martin School 04/03/2015] [YouTube] At: <https://www.youtube.com/watch?v=vaUfZak8Ug4> (Accessed 31/05/2020).
63. Vedral, V. (2018) *From Micro To Macro: Adventures Of A Wandering Physicist*. Singapore: World Scientific.
64. Vedral, V. (2020) *Decoding Reality* [Online: New Scientist Online Events 21/05/2020]

## Appendix

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### 1. Appendix One

#### Caution and criticism from and/of Barad and Deleuze

Karen Barad warns against and is critical of others who make reductive analogies and misinterpret, notably playwright Michael Frayne - author of *Copenhagen* (1998) who appropriates physicist Werner Heisenberg's Uncertainty Principle. There are also repeated warnings about scaling up quantum behaviours and applying them to the macro-world, but it is hard for a general reader like myself not to see how the book's philosophy isn't at times doing just that. We are urged to take into account how physicist, "Bohr often makes reference to the epistemological lessons of quantum theory, and sees the framework that he offers for quantum physics as having general relevance beyond physics (Folse 1985)" (Barad, 2007: 69). And that "Taking the ontological implications seriously, agential realism also reworks our understanding of what happens in the laboratory" and "provides a framework for thinking through the larger implications" (ibid: 337). Each of the terms looked at here, *intra-action cut*, *entanglement*, *indeterminism* and *superposition* can be thought of as far more than mere descriptions of "piddling laboratory operations" (Barad 2007: 336, citing David Mermin, 1998: 753-67). There are critiques of this strategy (see below) but by applying Barad's work to photography, despite the risks of over-simplification, we are doing precisely what she and Bohr have suggested.

Gregory Hollins (et al, 2017) in *Dis-entangling Barad* almost ridicules the academic for having garnered a plethora of citations and also those who refer to the book, which threatens to undermine their critical stance elsewhere as it smacks of envy. Even though Barad identifies the risks, they criticise what they view as analogy as well as scaling up in the thesis. They go on to explain how Barad's "emphasis on entanglement [...] accounts for a certain ambivalence within strands of STS [science

and technology studies]" (2017: 4) which is understandable. But that the diffractive approach offers "significant scope for rapprochement between Barad's work and that in other strands of STS" (ibid: 23). (Over the course of several edits, I dropped references to diffraction in this essay for the sake of word count and to make space to focus on entanglement – the more dangerous option according to Hollins, in terms of oversimplification and analogy.)

Although we are used to thinking about quantum physics describing the very small and classical physics, the large, Barad urges us to consider how these "separate determinate boundaries and properties" (2007:337) are based in Western human habits of thought. They are different models that aim to describe how things work in the same universe – not in separate realities (ibid: 110).

Despite all the above, and at the risk of doing exactly what Barad and Hollins warn against, we might consider how entanglement is an emergent phenomenon. As are intra-active relationships. And as is language. When I first started trying to understand Barad by watching videos of her talks, I wondered why she was suggesting matter mattered more than language. She wasn't, however. She was saying in post-structuralist theory, matter has been ignored in favour of language but in fact they are interactive and phenomenological. If all matter is irrevocably intra-active and enmeshed with meaning and visa versa, then surely language itself is entangled. If language, whether spoken or written, visual or solid - as in architecture (and yes, I am aware that some people think referring to photographs, art and architecture is reductive), then surely it has always been a deeply entangled phenomenon. And what of relationships – we exist through our material relationships? If my toddler falls over, I feel it and might cry out, even if she is in a different room. If I'm very close to someone, we will often speak at the same time. If I work long enough with others we will begin to fall into a rhythm where language may no longer even be needed. So, while I respect and understand that scientists

don't want us to oversimplify or misconstrue or belittle the enormous strangeness and difficulty of quantum theory - if we begin to look at reality through a quantum lens, and appreciate how entangled we have always been, some of it might begin to seem less unfamiliar.

## 2. Appendix two

### A short glossary of terms

This list is not intended to give full explanations but instead offer brief descriptions, which might help readers gain a quick but superficial grasp of unfamiliar terms used in the essay. Many of the terms are expanded on in the essay and examples from photographic practice given. There are no citations here as the aim is to keep it as simple as possible. Justifications and citations are available throughout the essay.

**Apparatus:** Vilém Flusser uses the term to refer to the state or market system which operates beyond individual human agency. In the vernacular of science, apparatus are the objects (non-human) you use to conduct the experiment. Flusser also uses apparatus when describing everyday non-human objects, such as cameras, and so 'apparatus' becomes a Russian doll - which is an analogy he employs.

**Diffraction:** when waves of light, sound or any material interact there is a diffraction pattern. The word has been taken up by Barad to describe a way of thinking about concepts that does not follow traditional Western dialectical practice but rather asks us to consider the superposition of ideas.

**Emergence:** Within systems, overall behaviours are dependant on collective actions and processes. The behaviour of an overall system often has an effect of the individual entities within the system. Phenomena emerge once entities within a system are in place. Consciousness is perhaps seen as the ultimate emergent event.

**Flow:** Deleuzian term to describe forces within a system which impact on other parts of the system.

**Indeterminism:** A term defined by Neils Bohr which opposes Einstein's determinist physics. We cannot say A would have been different if placed alongside C instead B because A and B were not discrete objects that existed prior to their intra-active emergence.

**Intra-action:** Relationships between entities don't only exist on the surface. Changes come about within – entities and their actions are enmeshed.

**Performative:** This does not mean performance – as in an actor on the stage - but is etymologically related. Repeated, socially habitual, discursive and material actions reinforce the shape and patterns, the scarification of a culture. For instance, exclaiming, "It's a boy!" when an infant with male genitals is born reinforces gender distinctions that exist in our culture. The statement isn't simply describing; it's repeating the long history of what it means to be a boy in a particular culture.

**Probability:** Heisenberg's term to describe intra-actions of entities. Uncertainty was challenged by Neils Bohr. Reality is measured within a scale of probabilities.

**Rhizome:** Deleuze and Guattari's description of the entangled nature of material and discursive culture.

**Superposition:** Waves, and some particles can be in the same place at the same time.

**Representationalism:** The notion that there are representations and things waiting to be represented elsewhere. Within reality, "things" are emergent, relational and contextual. There is no other plane containing things.

### 3. Appendix three

#### Digital material as matter

It is usual for photographers to distinguish between analogue and digital - and to apply hierarchical values to each. In *Data Selves's*, (2019) a book used in research for this essay, Deborah Lupton suggests data is a material substance which becomes embodied through intra-active assemblages. To think of data as something that

doesn't exist is a mistake. It "seeps", "floods", "contaminates" and "corrupts" (Chapter 3, *Materialising Data*, 2020: 44-73). It is more-than-representational. Lupton also suggests we can use Barad's work, "identifying matter and how it comes to matter" to consider data as "a form of matter" (ibid: 123).

#### 4. Appendix four

##### Writing in the first person

An agential realists account of objectivity is complex, beyond my current understanding, and probably requires an essay in its own right. However, in 2016, I was commissioned to photograph an acquaintance, Mandy Thatcher, who at the time was facing a third incidence of cancer and receiving chemotherapy. She was also doing an MSc and looking at the interconnection between voice, power and gender. She emailed me about her thesis:

The starting point for our Masters is that the dominant, masculine way of viewing and understanding the world via logical, rational, empiricist study – which encourages detachment and abstraction – is connected to our failure to finding new ways of understanding our world in a deepening social and ecological crisis. So we are pushed to practice radical "extended epistemology" where we give experiential and presentational (artful) knowing as much value as propositional knowing (ideas, theories, etc.). It's viewed as a very necessary rebalancing of our rational/emotional (feminine/masculine) faculties. Hence my focus on artful inquiry in this project. It's also why we're encouraged to write in first person right from the start – to avoid that traditional academic language of detachment. (Thatcher, 2016)

Since having our discussions, I have been influenced by this argument and spoken with several academics that do the same. The decision to include "I" in my own essay



is not a superficial affectation but rather a valuing of "I", intra-action, context, and recognition that the human view is a parochial one, situated within a specific position in the universe.

Mandy received a First for her dissertation. She passed away earlier this year.

draft