HAS A SYSTEMS ESTHETIC BECOME THE "DOMINANT APPROACH"? AN INVESTIGATION INTO THE SIGNIFICANCE OF SYSTEMS THINKING IN ART TODAY

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A thesis submitted to the University of Huddersfield in partial fulfilment of the requirements for the degree of Master of Research

The University of Huddersfield

December 2016

Abstract

This thesis explores the writings of Jack Burnham, examining the veracity of his claim made in 1968 that a systems aesthetic would become the "dominant approach". It thematically traces the presence and influence of systems art within art production from the 1950s up to the present day, analysing work produced before, during, and after the period of the 1960s and 70s that is traditionally associated with the systems perspective. It is argued here that works made both before and after the time of 'systems art' can still be viewed through a systems lens. Thus works of Rauschenberg, Cage, Bulloch, and Eliasson are placed within the systems sphere alongside Graham, Nauman, and Haacke. It also considers the value of a number of contemporary theoretical and critical positions which appear to have grown from, or at least have significant resonance with Burnham's "Systems Esthetics" – in particular the *Relational Aesthetics* of Nicolas Bourriaud's, and the Actor-Network theory of Bruno Latour and John Law. After some consideration of the relational and trans-institutional characteristics of these positions, it is suggested that Actor-Network Theory might stand as the heir to Burnham's "Systems Esthetics", and that as a consequence, something resembling a systems aesthetic has in fact become the dominant approach – not only the context of artistic production, but also in the context of society as a whole.

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Introduction

> We are now in transition from an object-oriented to a systems-oriented culture. Here change emanates, not from things, but from the way things are done. (Burnham, 1968, p. 31)

In 1968, Jack Burnham (p. 35) made the assertion that a systems aesthetic[1] would likely become the "dominant approach" to art production in an increasingly technological society. In 1980, Burnham came to reject this idea, dissatisfied with the art that had been produced in the twelve years since he made his original claim. Technology has advanced further since Burnham made these statements. Indeed, we live in a time where the ideas of network and processes are all pervasive, and in a culture when performativity, participation and relationality have become central to many conceptions of contemporary art. With this in mind, this thesis asks if it might be time to re-evaluate Burnham's position. Over the last decade, we have seen a resurgence in both Burnham's writing and systems art itself. Exhibitions looking back at systems artworks have taken place, and Burnham's systems concept appears to be the focus of study more than ever before. This project has used Burnham's writing as a central reference to chart the progress of the idea of systems art from the 1950s to the present day. It is suggested here that systems thinking has become so engrained into our contemporary thinking about phenomena that systems cannot be anything other than the "dominant approach". This systems approach was implemented by artists with the view that art should be more responsive and inclusive of the environment and viewer, and although associated primarily with technological art during the 1960s and 70s, it will be proposed that a great deal of art from this period onwards can be viewed in some ways as systemic or at least derivative of systems art. This is not to say unequivocally that all art produced today can be termed systems art, but rather that it does not seem unreasonable to suggest that given the contemporary leaning towards relationality and process, much of today's art can at least be viewed from a systemic perspective.

In the time spent writing this thesis and developing the accompanying practical work various aspects of systems art have been explored; the nature of systems art from its inception up to now, the role of the artist and viewer, and the use of technology in an artistic context. As the project has developed, it has also come to consider how systems art and thinking relates to contemporary society and culture in a broader sense, considering what this means for the way that we view not only the most contemporary art but also the machinations of our day to day affairs. The practice that has taken place within the project has been focused primarily on developing systems environments which make use of traces of the viewers' activity as a component of an aesthetic digital process, utilising this to further explore the definition of systems art, the role of the artist and viewer, and the use of technology in an

[1] This more commonly accepted spelling of the term "aesthetic" will be primarily used throughout the text. The spelling of "esthetic" in the sense that Burnham uses it, will only be used in the case of referencing titles (i.e. "Systems Esthetics"), and direct quotes. Burnham interchanges "esthetic" and "aesthetic" between his texts (though there does not appear to be any specific reason for his doing so), and so it is worth noting that where the term appears within direct quotes from Burnham, the spelling which correlates directly with Burnham's usage will be used.

aesthetic context. Reflections and outcomes resulting from the practice-based side of the project will be included throughout this text where they seem appropriate, and finally a dedicated section of the thesis will examine outcomes of the practice in more detail.

It is important to note that systems thinking first arose out of a non-artistic context, within scientific and technological theories such as Ludwig von Bertalanffy's General System Theory and Norbert Wiener's Cybernetics, and it is with these theories that we will begin. We will go on to consider systems art over the last sixty years in relation to von Bertalanffy and Wiener's aims and ideas, and in the spirit of systems thinking and contemporary positions such as Actor-Network Theory, we will attempt to delineate a network of thinkers, art critics and artists whose ideas resonate with the idea of the system as artwork. In so doing, we will attempt to identify a range of interconnected artistic styles and movements, beginning with very early minimal and conceptual art by Robert Rauschenberg and John Cage which could be termed proto-systems art, moving through the more orthodox works by Dan Graham and Bruce Nauman that have been explicitly termed systems art, and finally surveying more recent relational art by Angela Bulloch, and Olafur Eliasson from a systems perspective. A central claim of this thesis is that whilst there are many ways in which these styles and movements are distinct, they can nevertheless be productively viewed through the lens of systems thinking. Accordingly, a large part of the text focuses upon the significance of Burnham's systems concept, examining his ideas from "Systems Esthetics" in 1968 up to his eventual rejection of his ideas in 1980.

Systems Thinking in a Non-Artistic Context: General System Theory and Cybernetics

Systems thinking encompasses the idea that instead of looking at the world in isolated parts, we should view it as a complex whole (Ramage and Shipp, 2009, p. 1). There, however, are a number of strands to systems thinking - each with slightly differing but overlapping agendas and each containing their own thinkers and theories. These positions are connected by their focus on systems, but collectively they address areas as diverse as learning, technology, engineering, management, politics, psychology, and, the subject of discussion here, the arts[2]. Indeed, it is possibly this transdisciplinary nature of systems thinking that proved attractive to artists and facilitated its adoption in an artistic context. Systems theory is not limited in its scope and can be used in a range of disciplines. That is to say, it does not concern anything overly subject specific, rather, it is an alternative way of seeing the world as a whole. Instead of looking at people, objects, situations and processes as singular entities

[2] Some examples include: system dynamics, developed as a mode of computer simulation in order to determine how decision-making affects various aspects of society; complexity theory, used in relation to physical, thermodynamic systems, and learning systems, which focus on learning practice amongst varying numbers of people. (Ramage and Shipp, 2009) Systems analysis is also described by Burnham as being used in government practice, especially in relation to modern warfare and military decision-making. (Burnham, 1968, p. 2)

separate from their surrounding environments, the systems thinker considers everything holistically and processually, as a network of dynamic interdependency.

Perhaps the most relevant strands that might to serve best to open our discussion here are General System Theory, devised by biologist Ludwig von Bertalanffy in the 1930s, and Cybernetics, coined by mathematician and philosopher Norbert Wiener in 1948. Considered major schools within systems thinking, the two are often taken to be synonymous (Shanken, 2015, p. 13), and most other strands of systems thinking are typically considered to have developed from one or both of them in some way (Ramage and Shipp, 2009, p. 2). The very generality of von Bertalanffy's General System Theory suggests a foundation for us to think about all systems, whilst Cybernetics provides us with an alternative, similarly aligned, though in some sense more focussed contribution to the school of thought. It is, however, important for our purposes here to recognise that von Bertalanffy approaches the system from a biological standpoint, whilst Cybernetics approaches the system from the perspective of technology. Both of these theories are referenced by Burnham, and as such they stand as important influences amongst artists, albeit by proxy, largely through the writings of Burnham.

Ludwig von Bertalanffy's General System Theory

A system, according to von Bertalanffy "may be defined as a set of elements standing in interrelation among themselves and with the environment" (1972, p. 417). A biologist before anything else, it was within this subject area that von Bertalanffy first embraced systems thinking, adopting an "'organismic' conception of biology" (Ramage and Shipp, 2009, p. 57), looking at things holistically (von Bertalanffy termed this "wholeness") as opposed to reducing phenomena down to independent, detached entities (von Bertalanffy, 1950, p. 104). Subsequently, von Bertalanffy became concerned with the idea of the open system, and it was from this that he developed General System Theory, developing a set of principles that could be applied to all systems regardless of "the nature of their component elements or the relations or 'forces' between them" (p. 109). The notions of open and closed systems are central features of General System Theory, and will recur throughout this text. Von Bertalanffy describes the open and closed system as follows:

> We call a system closed if no materials enter or leave it. It is open if there is inflow and outflow, and therefore change of the component materials.
> (p. 113)

The open system is affected by external phenomena, allowing it to grow and change continuously. The closed system is isolated, unaffected by external phenomena but still operating in a systematic manner. These concepts are therefore also concerned with boundaries – attempting to encapsulate a system in order to identify where material or energy enters or leaves it. In the case of the closed system, in most cases a boundary can be easily identified, where in the case of the open system, boundaries are less identifiable, and in many cases do not exist at all.

Norbert Wiener's Cybernetics

Cybernetics approaches systems thinking from another angle, emphasising technology as a key element. Wiener believed that communication between man and machine would play an increasingly large part in society, and that we should study the ways in which we communicate both amongst ourselves and with machines in order to have an understanding of society itself (Wiener, 1968, p.18). Cybernetics is focused on the relationship between humans and machines, and observing the parallels between them. This, Shanken (2015, p. 13) comments that it, "supplied a theoretical model to construct and control mechanical systems that exhibit life-like behaviours". Thus Cybernetics concerned with observing how systems can exist in a homeostatic state through feedback, and establishing a continuous process of control and communication in which the system responds to information:

> Information is a name for the content of what is exchanged with the outer world as we adjust to it, and make our adjustment felt upon it
> (Wiener, 1968, p.19)

Cybernetics was further developed in the 1970s resulting in Second-Order Cybernetics, developed by Heinz von Foerster. This more socially oriented strand of Cybernetics became an extension of the theory, which Foerster called a "cybernetics of cybernetics" (Foerster, 1979, cited in Ramage and Shipp, 2009, p. 186). This led to include "the nature of the observer as well as the system being observed", and involved the application of cybernetic principles such as feedback and control to both the observer of the system as well as the observed system in order for it to be fully understood (Ramage and Shipp, 2009, p. 181). Foerster did not develop the approach in an attempt to discredit Wiener's Cybernetics (p. 181), but to recognise that it can and should be used in relation to multiple systems on multiple levels simultaneously, rather than in a manner which sees a singular system observed from an external position. In many ways, this stance presents a greater holistic view, as it does not separate entities or systems from one another but regards the observer and the observed system in the same manner, noting the interdependent relationships that form between them. This is a view which is consistent throughout this text - that the observer (the audience) should not be considered in isolation from the observed system (the physical/visual aspects of the artwork) but as a symbiotic component, as well as a system in itself containing its own processes and components.

Relations and Distinctions between Von Bertalanffy's Naturalistic and Wiener's Technological Systems Thinking

We are now equipped to begin a detailed comparison of General System Theory and Cybernetics. It should be apparent from what has been said thus far that despite claims made in the secondary literature towards equivalence, the approaches that von Bertalanffy and Wiener take are in many ways different. Most significantly, von Bertalanffy's focus is naturalistic whereas Wiener's is primarily

technological. However, it is likewise interesting that von Bertalanffy's naturalistic theory can be used to give an account of technological systems, and Wiener's technological approach can be seen as an attempt to bring natural (or human) and technological systems together. Von Bertalanffy's General System Theory observes natural laws in order to understand systems, but when we look more closely at Wiener's Cybernetics, we can see that although it is centred on technological systems, these systems are based on concepts from biology– for example Wiener's central concept, homeostasis, usually occurs within living organisms in order to regulate temperature, but this process can also be replicated artificially - within machinic central heating systems, for instance. Both undergo a similar feedback process, but only one of them does this organically.

Thus, von Bertalanffy discusses organic processes as structured systems, whereas Wiener discusses broadly machinic systems that exhibit life-like natural behaviours. We can view this as Wiener and von Bertalanffy adopting rather different starting points, but moving towards a point of mutual interest where the natural and technological begin to overlap. In a basic sense, it could be said that General System Theory develops the view that living organisms should be viewed as systems, whereas Cybernetics ultimately suggests that systems should be viewed as living organisms. Thus in terms of application, there is a sense in which General System Theory and Cybernetics are substantively the same, however, it is important to note that they differ in their approach and in their bio-technological emphasis.

There is no doubt that General System Theory and Cybernetics both played an important part in laying the foundation for Burnham's formulation of the field of systems art. As we shall see, the concept of the open system is fundamental and has been adopted by artists as a basis for making work. It was so central in fact that the term was used to title Donna De Salvo's 2007 exhibition, *Open Systems: Rethinking Art c.1970*, at the Tate Modern which looked back at the period of systems art, with De Salvo remarking that it "characterises this widespread preoccupation in art produced by a cross section of artists in the United States, United Kingdom, Europe and South America" (2005, p. 13).

Systems Thinking and Art

Now the foundation has been laid for systems thinking in a non-artistic context, we can progress to look at systems thinking in more detail and in relation to art production. In the first instance we will unpack the work of Jack Burnham. We will go on to look at artworks that have been produced from the 1950s up to the present day, with an aim of understanding the nature and evolution of systems art, and its contemporary significance.

It is worth noting here that there are strands within systems art which are concerned with specific takes on systems thinking – much cybernetic art, for example, has a focus upon technology and our relationship with it. This separation or categorisation of sorts is demonstrated within the work in De

Salvo's exhibition - on the surface the works were diverse, but they were linked by their systemic character. The works in De Salvo's exhibition included Andy Warhol's *Brillo* (1964), Richard Long's *A Line Made by Walking* (1967), Mel Bochner's *Measurement: Room* (1969), and Sol LeWitt's *Buried Cube Containing an Object of Important but Little Value* (1968). These were presented alongside works such as Hans Haacke's *Condensation Cube* (1963-5), and Dan Graham's *Public Space/Two Audiences* (1976), which will form part of this discussion. The works included in the exhibition are rather diverse in focus and their application of systems, but nevertheless are linked by their overriding use of a systemic, processual approach which demonstrates further the wide purview that systems encompasses. This study will begin by discussing work with a specifically technological, or socio-technological orientation. Later we will consider a wider range of work – both pre and post orthodox systems art - that might nevertheless lend itself to analysis from a systems perspective.

The Development and Influence of Jack Burnham's Systems Approach

Burnham began writing about artworks works associated with systems and technology and ultimately coined the term 'Systems Art'. During the systems art period, considered to be the late 1960s and early 1970s, Burnham wrote what is arguably his most known text, "Systems Esthetics" in 1968 – indeed, it emerges right in the middle of the systems period. The ideas he presented in the texts he wrote between 1968 and 1980 were by no means finalised - they varied, changed, and developed throughout, allowing the reader to follow the fascinating developments of his thought process over the twelve year period. In the last of his works, "Art and Technology: The Panacea that Failed" (1980) Burnham came to reject a lot of his earlier claims, and even went as far as to question the validity and success of systems art itself. However, it feels as though this rejection may have been premature when considering his work in relation to art and art theory today. As we shall see, a substantial amount of contemporary art and theory seems indebted to Burnham. Nicolas Bourriaud's *Relational Aesthetics* and the relational art surrounding it could in particular be said to grow from, or at least be highly resonant with ideas presented by Burnham, with a focus upon the way in which people and objects are connected and interact in an art context. Actor-Network Theory does something similar in both artistic and non-artistic contexts, viewing situations as networks made up of both people and objects which are all of considered of equal agency. Artists such as Dan Graham, Angela Bulloch, and Olafur Eliasson are all making art today that could be thought of as systems art, but it is generally termed relational art - this will lead us to make further links between Burnham and Bourriaud.

It might be suggested that Burnham's writing is processual in nature, the manner in which the ideas he presents morph and change over the twenty-year period not unlike the way that some systems artworks operate. Absorbing information from the art world and society generally, Burnham seems to respond through a process of feedback, arguably his writing over the two decades exists almost as an open system in a way comparable to systems artworks, and forming a somewhat symbiotic

relationship with the world around it. Burnham's description of the artist in relation to the open system seems particularly significant here:

> In evaluating systems the artist is a perspectivist considering goals, boundaries, structure, input, output, and related activity inside and outside the system. Where the object almost always has a fixed shape and boundaries, the consistency of a system may be altered in time and space, its behaviour determined both by external conditions and its mechanisms of control.
> (1968, p. 32)

Burnham's description of the artist above can not only be used in relation to the role of the artist and the artworks we will discuss here, but goes some way in demonstrating the way in which Burnham seems to approach his writing. A more contemporary approach which is nevertheless resonant with Burnham's can be found in Carlo Ratti's *Open Source Architecture Manifesto* (2012). As shown in Figure 1, a plotter linked to a Wikipedia page containing the Open Source Architecture Manifesto text copies continuously exactly what is on the page at that time onto a whiteboard. As an open-source website, Wikipedia pages can be edited by anybody, and so as people edit the manifesto, the plotter crosses out and overwrites what is displayed in real-time to correspond with what currently appears on the page. (Fairs, 2012) The manifesto is collaborative, relational, and evolves in real-time, with each version connected to what is both before and after it. What is particularly interesting about this artwork is that this process of it being rewritten is visible to the viewer – they can see exactly what has been altered, removed, and added, and both past and present versions of the manifesto are presented to the viewer concurrently, illustrating its ongoing process. This could be seen to demonstrate a process similar to that of Burnham's – one involving continuous rethinking and adaptation, with each set of ideas he presents evolving from the last. Burnham's thought process through the writing of his several texts is less obvious to us than demonstrated within this artwork but we can nevertheless observe changes and alterations in his thinking from that of the previous, leading up to the rejection of his ideas. It then seems appropriate that Burnham's method of writing would be viewed in this way, as a process which mirrors that of the open system, in which his ideas evolve and change in response to feedback from his environment.

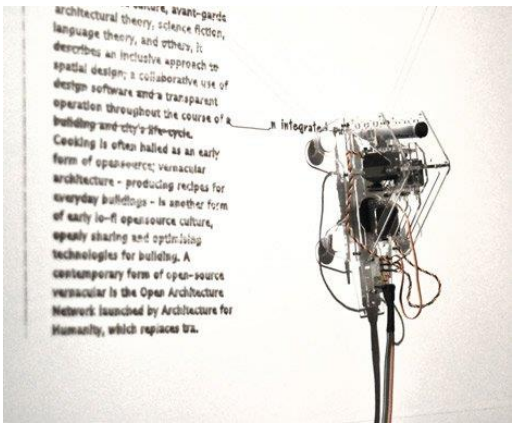

Figure 1. Open Source Architecture Manifesto Installation View. (Ratti and Nicolino, 2012)

Lest it be thought that this is a controversial claim, there is evidence of this processual approach to writing in both historical and contemporary process thought. In Deleuze and Guattari's *A Thousand Plateaus* (1980), the concept of the rhizome - a never-ending series of interconnections with neither a beginning nor end, existing "…between things, interbeing…" (p. 25) goes some way in illustrating this. Considering this concept in relation to writing, they go on to comment that, "…writing [is] always the measure of something else. Writing has nothing to do with signifying. It has to do with surveying, mapping…" (p. 4-5), which would appear to demonstrate their view of writing as processual, growing outwards in multiple directions from an idea, rather than developing in a linear fashion.

The Resurgence of Systems Esthetics and Systems Art

At the beginning of the 21st century "Systems Esthetics" was described by Luke Skrebowski as "now relatively obscure" (2005, para. 7). However, Burnham's work has since been reprinted in a number of books and exhibition catalogues, as well as re-examined in several academic journals.[3] This resurgence of interest has even become the subject of study in itself, in Edward A. Shanken's *Reprogramming Systems Aesthetics* (2009). In fact, the entire systems period appears to have been subjected to something of a renaissance. De Salvo's exhibition revisited and investigated the period characterised by the curator as "intriguing' and 'seminal" (De Salvo, 2005, p. 11). The thirty artists included in the exhibition are considered to have contributed to the transition, "linked by their use of a generative or repetitive system as a way of redefining the work of art, the self and the nature of representation" (De Salvo, 2005, p. 11). *Cybernetic Serendipity*, an exhibition held at the Institute of Contemporary Arts in 1968, also revisited systems aesthetics, in order to "highlight its impact and continued relevance today" (Institute of Contemporary Arts, 2014). A documentary style display of the exhibition, featuring installation photographs, documents and other related media was presented at the Institute of Contemporary Arts in London and Huddersfield Art Gallery in 2014. More recently, Whitechapel Gallery added *Systems* (2015) to their Documents of Contemporary Art book series – the book contains a relatively even balance between texts written between 1960-80 and 1995 to present, some of which directly respond to Burnham's "Systems Esthetics".

The recent resurgence of systems art and the exhibitions and texts that came with it lays a foundation for the idea that systems art and its ideologies are not in limited to any particular period, be it the 1960s and 70s or otherwise.[4] With this in mind, we might re-evaluate Burnham's rejection of his own

[3] "Systems Esthetics" was reprinted in the *Open Systems* catalogue (2007), as well as in Whitechapel Gallery's *Systems* (2015). Texts written in recent years, some of which are included in *Systems*, that directly respond to "Systems Esthetics include: Edward A. Shanken's "Reprogramming Systems Aesthetics" (2009-14), Francis Halsall's "Systems of Art" (2008), Caroline A. Jones' "Systems Symptoms: Jack Burnham's 'Systems Aesthetics'" (2011), and Luke Skrebowski's "All Systems Go: Recovering Jack Burnham's 'Systems Aesthetics'" (2006).

[4] Artworks made during the period are still being exhibited and regarded as important today, alongside major exhibitions such as *Open Systems* and *Cybernetic Serendipity*. Both Dan Graham's *Present Continuous Past(s)* (1974) and Hans Haacke's *Condensation Cube*, works both included in De Salvo's *Open Systems* (2007) were also included in Tate

ideas. Arguably the fundamental tenets of systems are now widely accepted and the theory has proved to be highly influential. This is demonstrated by their reappearance within several publications and their frequent accompaniment to exhibitions.

Artistic Reflection (Louise Robson)

I had already started to adopt a holistic and process oriented view within my practice before specifically learning about art and thought associated with systems. I first encountered systems art and "Systems Esthetics" *in 2014, around a decade after the period began to be revisited. I found that my ideas surrounding art making and viewing were very much aligned with artists associated with the period, and* "Systems Esthetics" *greatly resonated with my existing ideas. It was after this point that I began to locate my practice and it started developing in that direction. In one sense I found systems art, but in another it chose me. This leads me to question the origin of my systems viewpoint – was it already engrained into my thinking in some way or was it simply operative as a force in my culture? I have unquestionably been influenced by systems art and systems thinking, but was this purely a result of personal inclination, or might it have been due to other factors such as my surroundings, social experiences, and society generally? I find myself wondering if without the resurgence of systems art and I would still be making the systems-based work I am producing today.*

What is of interest here is that, as a developing artist interested in systems today, is the question as to whether I became a part of the resurgence of systems art through making systems based work, or if I make systems based work as a result of the resurgence. Perhaps it would be more productive to recast the question in systemic terms - we might question such a binary approach and ask if there is some symbiotic relationship between these two possibilities. Am I simply a node within a mutating, networked resurgence?

Burnham's Introduction to Systems Thinking: Systems Esthetics

When considering systems thinking in relation to the art world, Burnham's "Systems Esthetics" (1968) has pride of place. In this seminal text, Burnham first discusses transitions that took place in society generally due to shifts in technology, and then moves on to provide a survey of the changes that had happened in the context of art production:

> Transition between major paradigms may best express the state of present art. Reasons for it lie in the nature of current technological shifts.
> (p. 31)

Liverpool's recent *Works to Know by Heart: An Imagined Museum* (2016) exhibition, presented as important works to be remembered should all artwork suddenly disappear. *Dan Graham: Beyond*, Graham's first US retrospective was recently held at the Whitney Museum of American Art from June to October 2009. *Bruce Nauman: Make Me Think Me*, an exhibition including some of Nauman's corridor works, took place at Tate Liverpool from May to August 2006.

He claims that society altered to become less focused upon objects or products, and more focused upon the practicalities of living and the way things are done, marking a split between what we can term traditional art objects, and what Burnham terms "unobjects" – such as environments, kinetic art, and happenings. Burnham remarked that as society progressed technologically, art could no longer embody the aesthetic impulse simply by being decorative, it must instead be concerned with research and production, with a purpose to teach and provoke new ideas:

> The specific function of modern didactic art has been to show that art does not reside in material entities, but in relations between people and the components of their environment. (p. 31)

The artist no longer acts in the traditional sense as a craftsperson producing objects, but as a facilitator, "a symptom of the schism between art and technics" (p. 31) constructing relational situations and environments which allow for experiences to be had. In "Systems Esthetics" Burnham outlines what attributes a systems artwork may possess, some of which are listed below:

1. Conceptual focus rather than material limits define the system…a system may contain people, ideas, messages, atmospheric conditions, power sources, and so on. (p. 32)
2. …information, in whatever form conveyed, becomes a viable esthetic consideration. (p. 32)
3. …all phases of the life cycle of a system are relevant. (p. 32)
4. …possession of a privately fabricated work is no longer important. (p. 32)
5. …it would be impossible to regard a fragment of an art system as a work of art in itself. (p. 34)
6. Sight analysis diminishes in importance…the other senses and especially kinesthesis makes 'viewing' a more integrated experience. (p. 34)
7. …invisibility, or invisible parts, share equal importance with things seen. (p. 35)

These could be used as a framework to define the systems artwork in a similar way that Sol LeWitt's "Paragraphs on Conceptual Art" (1967) can be used as a guide for defining and identifying the recurring attributes or tropes of conceptual art. These qualities serve to summarise Burnham's view of the systems artwork presented in "Systems Esthetics", and they are likewise useful when thinking about more recently produced artworks to determine their position in relation to systems. In Burnham's view, the artwork is no longer a single material artefact, but a system made up of an unlimited number of interdependent components and processes. These components can take many forms, and so every aspect of the viewing environment, artwork and resulting experience could be considered as such. Significantly, these include the space or environment itself, any material or technological components which allow the artwork to exist, the viewer, and even the thoughts and feelings that the viewer experiences or undergoes. From a systems perspective it is less important that a work even be visible or tangible, nor that is has the status of an object that can be commodified or possessed. For Burnham, it is the relations and experiences that the artwork facilitates that are of most importance, and it is this he claimed would become more prevalent in the future, with a focus on technology as the driving force behind it.

Burnham's Increasingly Cybernetic Trajectory: The Aesthetics of Intelligent Systems

One of Burnham's subsequent texts, "The Aesthetics of Intelligent Systems" (1970) builds upon "Systems Esthetics", but also enacts a change. Whilst still focused upon the future of art, he appears to adopt an increasingly cybernetic stance, exploring the use of the computer in art production, and using the term "computer environments" (p.95) in the place of "technology". He appears to be increasingly interested in the concept of information exchange – something which he touches upon in "Systems Esthetics", claiming that regardless of form, information is a "viable esthetic consideration" (p. 32). He further expands upon this in "Real Time Systems" (1969) with the concept that art is a form of information processing. This phrase "intelligent systems" is used by Burnham to describe both humans and our computer environments, and he suggests that more attention should be given to the "aesthetic relationship" (1970, p. 95) between the two as technology evolves. We could view this as Burnham adopting Wiener's view on the man-machine relationship and applying it to the artwork-viewer relationship we are concerned with within systems art. He claims that we should aim to develop this relationship to allow for constant and more fluid information exchange on a two-way level (p.96), in order to recognise "man as an integral of his environment" (p. 100), and close the distance between artwork and viewer. We can see that alongside his further emphasis on technology, Burnham becomes more concerned with the role of the viewer in his later texts, moving from simply commenting that a system *can* contain people alongside many other attributes, to putting emphasis on the relationship between people and the "computer" environments (in other words, the physical or material aspects of systems artwork) to which they stand in relation.

In "The Aesthetics of Intelligent Systems" Burnham comments several times on the quality of the technological or systems art being produced at the time and this could be seen as an early sign of Burnham's eventual rejection of both systems art and some of his earlier claims. He remarks that "new and exotic technology has not led to the production of great or even good art" (p. 119), and claims that it would likely be over a decade before this kind of art would be successful (p. 119). He then continues on to say, in a somewhat conflicted manner, "In spite of much dissatisfaction with the results of technology in this century, I cannot believe that the world would willingly revert to a less sophisticated technological level" (p. 119). Although Burnham is dissatisfied with the art being made at that time, these comments still appear to support his previous claims surrounding the increasing use of technology in art production. However, through these comments we begin to get a sense that there is a very slight conflict developing in Burnham's thought, in the way that he seems to place a time limit of sorts on the success of systems art alongside expressing his disappointment with the art at that time. It is almost as if he is preparing to reject his ideas whilst still, for the moment, standing by them.

Defining the Artwork after Burnham

Here, we can look at the term *artwork* to further understand the distinction that Burnham makes between traditional art objects and "unobjects". Traditionally, the terms *artwork* and artefact have been used as nouns, to describe *things.* This is the traditional material art object, something which exists in a static, impervious manner, for example a painting or a marble sculpture. However, Burnham invites us to think of the artwork in active, performative terms, as something which *happens*. He encourages us to think of the artwork in processual terms as a kind of verb. This seems particularly appropriate when thinking about artwork which can contain interacting elements such as people, messages and atmospheric conditions. These sorts of systems encourage us to consider information is aesthetic terms, distributing aesthetic value equally across visible and 'invisible' aspects of a work. The systems artwork does not exist in a static and closed manner, but in a reactive, changing, and open manner in which it encompasses entire environments, including the people within those environments. Often it cannot exist in the same state as it has previously or will in the future, but is constantly changing – in the context of systems art something is always *happening*. This verb centric approach allows us to extend what we can think of as an artwork, and seems more accepting of systems art and the phenomenological, immaterial, and otherwise invisible, purely processual aspects of the work. Works become nodes in a network, in an art world that is itself processually happening. Thus from the perspective of systems art even more traditional, object-centric works are exhibited in a systems sphere.

The Art Object, Gallery, and Institution as Systems and Components

When considering Burnham's apparent rejection of the traditional art object in "Systems Esthetics" and his endorsement of a holistic approach to art production, the art institution and the position of the artwork within it can come into question. We might ask how the gallery relates to both the traditional art object and the systems artwork. Can we think about traditional art objects as systems or components of them? Does the gallery simply house artworks in a completely detached manner, or is it a component of the artwork and vice versa? Can we think of the gallery as a whole system, with the artworks it houses having just as much value as everything else within it, including the non-art spaces such as the gift shop and the café? On a further expansive scale, can we think of the art institution as a system, considering how everything in the art world (artists, artworks, galleries, art dealers, etc.) functions in a relational manner?

In "Real Time Systems" Burnham describes the art world as an "information processing system" (1969, p.49), focusing less upon specific artworks and more upon the effects of the shifts in art production on the art world as a whole. In the text, he discusses the role of the institution frequently but his claim below is particularly interesting in relation to this discussion:

> A major illusion of the art system is that art resides in specific objects. Such artefacts are the material basis for the concept of the 'work of art'. But in essence, all institutions which process art data, thus making information, are components of the work of art. Without the support system the object ceases to have definition; but without the object, the support system can still sustain the notion of art.
> (p.50)

Although Burnham could be viewed as in some sense rejecting the art object, describing it as "finite" in several of his works, the fact that he describes the idea that art could reside within an object as an illusion leads us to question whether art objects could in some sense be viewed as systems or at least as components of systems. If the "art" cannot reside entirely within the art object itself, this would suggest that something must happen to it externally. It would seem here that Burnham rejects any notion of the closed, or hermetically sealed art object. For Burnham the art object is something which both mediates a concept, and allows for the transfer of information. In this view, although seemingly static, the art object still brings something about, or allows for something external. In *Beyond Modern Sculpture*, Burnham approaches the art object from another angle, remarking that as a material system goes through a process of deterioration, it must be inspected and restored regularly (1968, p. 320). Could we then view all art – even the most traditional, object-centric works - as in some sense systemic? Given that even the most traditional art object undergoes a continuous transformative process in response to environmental factors, there is a sense in which it can be viewed in systemic terms. Burnham's observations concerning the materiality of works offers one way for us to view traditional works as components in material systems. However, it is clear that the artwork is also involved in a more expansive, cultural system that of the gallery, and the art institution as a whole.

Burnham explores the symbiotic relationship between the institution and an artwork. For Burnham, there is a sense in which the institution becomes a component of the artwork, in so far as it allows the art object to have definition, and another in which the artwork feeds the institution. Thus the art gallery provides a venue for artwork, and in so doing provides the context for the reception of a work *as* art. Developing the institutional aspects of his position further, Burnham notes how the artwork sits within an expansive system of processes within the institutional sphere:

> …art books, catalogues, interviews, reviews, advertisements, sales and contracts are all software extensions of art, and as such legitimately embody the work of art. The art object is, in effect, an information 'trigger' for mobilizing the information cycle. Making, promoting, and buying art are real-time activities.
> (Burnham, 1969, p. 50)

Whilst is clear that a venue provides an audience and in some sense positions an artefact as art, it is perhaps less intuitive (when viewed from an object-centric perspective) that the gallery should in any sense be viewed as a component of the work. To the object-centric critic or artist, it seems that, even without a venue, the artefact or object can still exist in the same physical form, and from this

perspective, it might be questioned how the gallery itself can be factored into the artists intent. However, from a contemporary perspective, it is not unusual for the artist to consider the site of the space in which their artwork will be exhibited and experienced. When it comes to the production of more traditional art objects however, such as paintings, it might still be questioned how much the artist considers what happens outside of the edges of their canvas. Burnham, however, recognises that in both cases the institution not only provides a venue, and the possibility of viewers, but also provides a support system on a much more expansive scale – and it is from the perspective of legitimation, promotion, and marketing that it can be said to act culturally, as a software extension of the work.

The view that the institution acts as a component is one seemingly agreed with by Olafur Eliasson. Eliasson discusses the role of the institutional environment in his text "Vibrations" (2006), commenting that the relationship between viewer and artwork is not enough alone, and that the institution plays a large part in allowing the viewer to have a real experience, acting as an integral part of a network made up other visitors and artworks:

> The institutional context in which the visitor and artwork are brought together is also essential, and together these form a complex network of elements that constitute the dynamic relationship between visitor, artwork and institution.
> (Eliasson, 2006, p. 72)

From this, we can see that Eliasson regards the institution as a component, acting in conjunction with the artwork and viewer. He goes on to comment that he views it as "crucial" that it should focus more on the experience that visitors have, and not specifically the artworks alone, allowing the gallery to create relations between itself and society (p. 72).

Developing from this, we can also consider the gallery as a system. We have already looked at the gallery in relation to artworks on a singular scale, as an artwork component, but if we view it from a wider perspective, we can view the institution in a more multileveled manner, as a system of systems. Every system has a number of components. If we consider each separate artwork in the gallery as systems in themselves, each of these artworks brings with it a number of components and undergoes its own processes. These artworks can then be viewed collectively, as components of a larger system, which again undergoes its own processes. A meta-system is created in which relations are formed recursively on several levels at once. Thus, there is a lower level, in which artworks are considered in a singular manner, where the institution is not considered a component. On the second level, however in which artworks are considered components, the institution can itself be viewed in systemic terms. Dan Graham further develops this idea, taking into consideration what the gallery houses aside from artworks, commenting that:

> …museums have some very good areas. The empty lobbies, the gift shop, coffee shops, sometimes the elevators. In other words, they're great places to look at people, who look at other people, who look at other people.
> (1999, cited in Pressplay: Contemporary artists in conversation, 2005, p. 253)

As we will see later when we consider Graham's work, this view is very much aligned with the context behind his installations and the experiences that they induce. Like, Burnham, Graham stresses that it is not only the specific exhibition spaces in the gallery that have potential, but the non-spaces too. Burnham's use of the term "support system" also strengthens this association.

Systems within Systems: Charles and Ray Eames' The Powers of Ten

Charles and Ray Eames' 1977 film *The Powers of Ten*, described by Mark Dorrian (2013, para. 1) as a "didactic exposition of the dimensional relations of things" can help in illustrating this idea of systems existing within systems, and demonstrates the varying scales and forms of systems on a broad scale. The film could be said to performatively illustrate the way in which *everything* can be viewed in systemic terms. The Eames' film begins with a one-meter square image of two people having a picnic, shot from one meter away. Every ten seconds, this distance increases ten times, and the image viewable within the square frame grows ten times in scale – an example of this can be seen in Figure 2. This continues until the apparent outer limit of the universe is reached, and the camera perspective reaches one hundred million light years away. Through this process, various systems are progressively revealed, including; the human, towns and cities containing travel networks and buildings, clouds (weather systems), planet earth, and the solar system. The film then reverses, zooming in sixteen times to present the systems inside the human body, revealing organs, cells, and capillaries, and ultimately revealing atomic and subatomic activity.

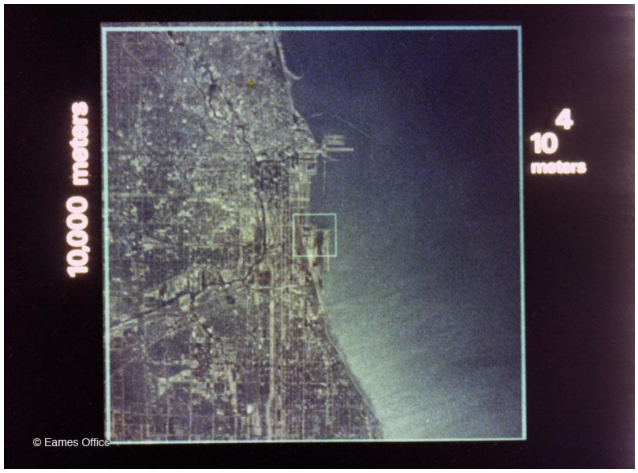

Figure 2. Video Still from Charles and Ray Eames' The Powers of Ten (1977)

The film powerfully demonstrates how everyday systems occur on multiple levels and scales. We are encouraged to see the human as a component of a greater natural and technical, but as a system in itself, harbouring an organ system which contains further systems (the organs themselves), which

contain even smaller systems down to a microscopic level. We have seen how Burnham essentially applies this kind of process-relational thinking to the institution and the artwork. Thus the artwork exists as a system in itself, and may contain systems on a smaller scale (Hans Haacke's *Condensation Cube* for example contains water which exists as a system, which contains molecules which act as further systems), but also exists as a component of more expansive systems both within its immediate surroundings (the exhibition space) and the institution as a whole (a system containing varying numbers of artworks and people). The institution could then also be viewed as part of an even larger system, as a building within a town or city, as well as in relation to other institutions and more intangible systems such as economic flows and systems of fashion and taste. *The Powers of Ten* demonstrates effectively the complexity and multileveled, seemingly endless nature of the relationality that exists within our universe, revealing systems within systems on both a gigantic and microscopic scale, encouraging us to refrain from viewing any entity, be it a human being, an inanimate object, or a system of clouds, as separate from its surroundings.

Lack of Hardware Value

Despite the potential for material systems to reveal nested processual relationality, Burnham's work arises out of a conceptual lineage and is more strongly oriented towards the immaterial. In "Real Time Systems", Burnham discusses this in relation to the institution at several points. Employing a computer themed analogy, in keeping with the overall emphasis of the text, Burnham discusses newer artworks which do not have any "hardware value" (those which do not possess huge amounts of value in a material sense alone). He suggests instead, that such works have "software significance for effecting awareness of events in the present" (1969, p. 52). For Burnham, systems artworks placed a greater significance on conceptual, or otherwise immaterial outcomes (i.e. relationships and experiences that form or occur as a result). Here, he remarks that galleries need to acknowledge this transformation, commenting that if they do not, "they will remain in a peripheral and potentially obsolete role in relation to the most advanced aspects of contemporary art" (p. 52).

Burnham's comments in "Real Time Systems" give rise to several questions. Firstly, we might consider what the consequences might be for the institution when increasing amounts of art have no permanent physical form and are therefore physical possession of them is not possible. Could it be that as more art with only "software value" comes about, that institutions could end up owning entire collections without any consistent physical form? Instead, blueprints, instructions and computer files could become the new way of possessing artworks. This fetishisation of project instructions or descriptions seems odd given that such works have no real value unless exhibited in their intended manner, however it does indicate one way in which systemic works could be brought in line with more traditional art markets. Although the terms software and hardware are here used in an analogical manner to talk about the material and immaterial manifestations of systems artworks, we can also

think about those artworks which exist entirely or at least partially as software on computers. Stored solely or in parts as computer files, or even online, it is not only the files that must remain accessible, but the platforms (e.g. operating systems and material hardware) for which they were built that must be archived – as compatibility can never be guaranteed with future systems and technologies. For example, Douglas Davis' internet artwork *The World's First Collaborative Sentence* (1994), a webpage which allows viewers to add their own contribution via a text box to create a never ending sentence, became dysfunctional in 2005, only a decade after it was first made. It has since been preserved by the Whitney Museum of American Art in order to fix issues such as changing platforms and formatting. There are now two versions of the sentence in existence – a historical version, which is no longer active but displays the sentence as it was when it lost function in 2005, and a live version, within which functionality of the work is restored to be compatible with current technologies. (Whitney Museum of American Art, 2012) In a society where technology is continuously developing, and is premised on increased speed, processing power, and innovation, often platforms and operating systems are left behind in favour of newer versions, which, demonstrated in the example of Davis' artwork, could render works un-viewable unless the platforms or operating systems are archived also (or institutions endeavour to update the artworks in line with new technologies). Issues related to the curation of new media art were the focus of much discussion on the CRUMB website at the University of Sunderland – a digital platform which, ironically has itself been down for maintenance for some time. It seems that when writing "Real Time Systems", Burnham may have viewed the institution at that time as skirting around, but never directly addressing systems art. We might ask, however, if there is genuinely any sense in which the same could be said today?

Artistic Reflection (Louise Robson)

In 2015, my artwork Feedback Camera *(2014) was purchased by the University of Huddersfield to be a part of the graduate collection. It consists of a projector, camera, and a computer program, and when not on display does not physically exist. When the piece was purchased, I provided the university with the computer program and instructions which would allow them to reassemble the piece – none of the physical components were provided by myself. If we look at this in terms of only hardware value, this piece has little, demonstrated by the fact that I did not need to supply the university with the physical components for them to own it, yet it does have software value, when the physical components are assembled in the correct way combined with the computer program I gave them. The university owns the work in the sense that I gave them permission to recreate it in the form of a contract – and it is possibly this which demonstrates where the value in this work lies, in the concept facilitated by the physical components, not the physical components themselves (although they are a requirement). In many ways, the university simply became a further addition to the*

"…complex network of elements…" (Eliasson, 2006, p. 72) that constitute the artwork and the system it participates in.

Burnham's Rejection of Art and Technology

The very title of "Art and Technology: The Panacea That Failed" (1980) says a lot about what to expect from Burnham's last text. While in his other texts he looks to the future in an optimistic manner, in this later work Burnham reflects on the recent past in a rather negative sense, describing the results of technological art at that point as "mediocre to disastrous" (p. 1); attempts at artificial intelligence "pale imitations" (p. 14), and cybernetic art "little more than a trivial fiasco" (p. 14). It would seem that Burnham quickly became dissatisfied when the predictions he presented in "Systems Esthetics" and his others texts were not fully realised a decade later. However, looking back now, over forty years since he first presented his ideas surrounding art and technology, his rejection seems premature and this might be taken to reveal an impatience on Burnham's part. Time and again we find contemporary artists, curators, critics and theorists calling for a re-evaluation of Burnham's ideas, and this would seem to suggest that even regardless of whether Burnham's ideas began to seem during the period he was writing, they are greatly resonant with much artwork being produced today. Caroline Jones (2012, p. 4), suggests that Burnham's ideas currently seem "tailor-made for the contemporary art world", Shanken (2009, p. 4), comments that Burnham's systems approach "offers significant potential for the analysis of both historical and contemporary art", and Skrebowski (2006, para. 31), remarks that "Systems Esthetics" could be viewed as an "important genealogical precursor to the relational aesthetics of a more recent generation of artists explicitly indebted to work produced c.1970", demonstrating this apparent renewed application of Burnham's work. Likewise we might draw attention to the prevalence and breadth of application of Bruno Latour and John Law's Actor-Network Theory as a mode of analysis. Latour's ideas are very much in vogue in contemporary philosophy, sociology and cultural studies. Arising within science and technology studies, the theory is strongly resonant with Burnham's highly technologized, process-relational vision. Due to the current acceptance of Burnham's ideas his rejection is of rather minimal importance here, but it is worth touching upon, as it further highlights the significance in the revival of his ideas.

Burnham's work has been discussed here with a view that the ideas he presents, even those he later discredits, are significant not only to historical art produced during the 1960s and 70s but the most recent contemporary art being produced today. It is demonstrable that Burnham's views are by no means limited to a certain period in history, and in some ways, with the continued development of technology and its absolute integration into society, are more relevant today than they were at the time of their conception. With this in mind we will examine a number artworks from a diverse range of periods, using Burnham's ideas to explore their links to systems art.

Analysis of Systems Artworks

In the late 1960s, systems thinking was adopted by artists who "reacted against art's traditional focus on the object with the aim of making their art more responsive to the world around them" (Tate, n.d.). Largely built upon minimal and conceptual art, systems art marked a move away from the traditional art object, with focus shifting towards the concept – many artists began to adopt a holistic stance during this period, which involved viewing the environment and spectator as integral components of the artwork. Systems art is closely linked to the process art movement which embraced the process as the subject of the work, positioning this with higher value than any end result. Although systems art is considered to have begun during the 1960s, examining some slightly earlier artworks (which we could term proto-systems art) will allow us to see how systems thinking is observable within art before this period, whilst also laying a foundation for the thinking present in artworks we will examine shortly. It will also serve to highlight some important links to minimal and conceptual art. These earlier works, produced during the 1950s, appear to align with the systems philosophy, largely open in their approach, but in contrast to the systems work of the 1960's-60s they do not have any focus on technology.

Proto-Systems Art: Robert Rauschenberg's White Paintings and John Cage's 4'33"

When viewed through the lens of systems art, in Robert Rauschenberg's *White Paintings* (1951) and John Cage's *4'33"* (1952) we can observe parallels which might lead us to consider them as early forms of systems art – or proto-systems art. On examination, both artworks appear more systems than object-oriented. That is to say, they are concerned with something *happening*, and offer unique, real-time experiences within which the viewer plays what could be considered an inextricable role. They are also open in nature, taking in from their surroundings and demonstrating an interdependent relationship between artwork, environment, and viewer.

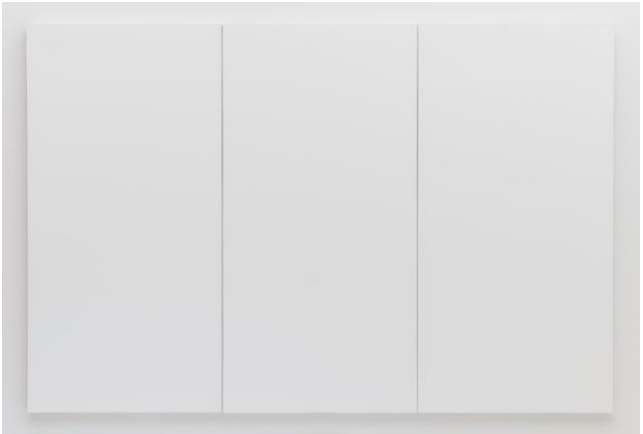

Figure 3. Robert Rauschenberg's White Painting [three panel] (1951)

In a series of five *White Paintings*, Robert Rauschenberg displayed one, two, three (Figure 3), four, and seven entirely white painted canvases. He intended to make something that "looked untouched by

human hands, as though it had simply arrived in the world fully formed and absolutely pure" (San Francisco Museum of Modern Art, n.d., para. 1) and so it was of great importance to him that the canvases were immaculate each time they were exhibited. This purity is not however in the sense that the paintings should be viewed as precious, irreplaceable objects as one might first presume. It is instead about the ability of the purity of the white surface to reflect aspects of the environment and viewers in a subtle manner. In an approach that was considered radical at the time, Rauschenberg remade and repainted the canvases a number of times, as well as allowing other people to remake them for him. The paintings could then be considered as temporary in a similar way to Dan Graham and Bruce Nauman's camera installations, only viewable in certain locations for limited lengths of time, and for some periods of time ceasing to exist as objects entirely.

John Cage's description of Rauschenberg's paintings as surfaces for light, shadow and dust is one commonly referred to, and is supplemented by Rauschenberg's comment that they are like clocks, providing the viewer with the ability to tell the time simply by looking at them. (San Francisco Museum of Modern Art, n.d., para. 3) The paintings are receptive to their surrounding environment, almost providing a reflection of it, becoming surfaces that allow the viewer to observe their own shadow, the shadows of other viewers, and other subtle environmental happenings (such as dust particles moving and changes in light) between themselves and the white plane. In the simplest fashion, the viewer merges with the canvas in front of them - they are no longer observing something from an external point of view, becoming intimately connected with the work in an at once perceptive and introspective fashion. This alteration to the role of the viewer is, according to the San Francisco Museum of Modern Art (n.d., para. 3), where the interest is located in the paintings: "the power of the *White Paintings* lies in the shifts in attention they require from the viewer, asking us to slow down, watch closely over time, and inspect their mute painted surfaces for subtle shifts in color, light and texture."

Figure 4. Installation view of Robert Rauschenberg's White Painting [three panel] and John Cage's 4'33" at the San Francisco Museum of Modern Art (2008)

Rauschenberg's *White Paintings* are frequently grouped with John Cage's silence piece, *4'33"*, and the two were even exhibited alongside each other at the San Francisco Museum of Modern Art in 2008 – an installation view of this can be seen in Figure 4. Cage's piece is highly resonant with Rauschenberg's paintings, but instead of inviting the viewer to observe subtle elements of the environment visually, it happens aurally. A composition lasting four minutes and thirty three seconds, 4'33" invites the audience to listen to silence – or, as Cage wanted to highlight, the lack of it. Taking place originally in a concert hall, with the start and finish signified by a pianist sitting at and standing up from a piano, the viewer is invited to become more aware of their surroundings, more specifically the ambient sounds within them.

As well as having clear connections to minimal, conceptual and process art, all of which are deep-rooted within the beginnings of systems art, it is the relationships between artwork, viewer and environment within these works that has led to their inclusion in this text. The viewer is invited to both create and experience simultaneously - without a viewer these artworks are in many ways meaningless.

The Position of the Object in Systems Art: The White Paintings' Alignment with Systems Philosophies

In many ways it seems that Rauschenberg values the art object in the same way as systems artists, and so we can begin to see here how his *White Paintings*, although not typically associated with systems, might be considered early forms of systems art or at the very least encompassing of some systems philosophies. Demonstrated by the fact that Rauschenberg reproduces the paintings, we can see that he does not place any importance on the paintings as unique art objects – instead, importance is placed on the ability for the paintings to activate a concept, positioned as a component of a system in relation to their surrounding environment and viewers within that environment. Ultimately it does not seem important to Rauschenberg how the object is made, or what happens to it after its use within the exhibition context, because it is the concept and experience that the object mediates as part of a system that is important.

It is important to note Rauschenberg's association with Experiments in Art and Technology (otherwise known as E.A.T.), an organisation formed by himself, artist Robert Whitman, and engineers Billy Kluver and Fred Waldhauer in 1966, in an attempt to bring together technology and the arts (Foundation Langlois, 2000, para. 1). It was also this year during which the *9 Evenings: Theatre and Engineering* event took place. The event began with Rauschenberg's performance entitled *Open Score* (1966) which consisted of two movements, constrained by various instructions, rules, and systems. The first movement, as shown in Figure 5, involved two people playing a tennis match – microphones attached to the racquets relayed sound to speakers in the performance hall, causing a reverberation every time one of the tennis players hit the ball. Each time one of the players

hit a ball, a light in the hall also went out, until eventually it was plunged into darkness (Lee, 2016). The second movement involved five-hundred performers who moved around the stage following rules that Rauschenberg had laid out previously, such as “move apart”, “touch someone who is not touching you”, and “draw a rectangle in the air as high as you can reach” (Bonin, 2006). These performers were filmed with infrared cameras (as the hall was still in darkness) and displayed on three screens for the audience to see.

Figure 5. Robert Rauschenberg's Open Score (1966) at the Nine Evenings

Cage also took part in the *9 Evenings*, with his performance *Variations VII* (1966), which involved amplifying random sounds from the performance hall through the use of technologies such as telephone and radio. These sounds however, were only amplified when photoelectric cells situated on the stage were triggered by participants (Bonin, 2006). Both located fittingly within the systems sphere during this period, as well as clearly engaged in the use of technology, Rauschenberg’s eventual reinvention from a painter towards this interdisciplinary mode of practice, and Cage’s participation in the *9 Evenings*, can be said to demonstrate the fact that the *White Paintings* and *4’33”* are recognisable precursors to systems art, both in terms of art production as a whole, and in Rauschenberg and Cage’s praxis.

The almost temporary nature of the *White Paintings* is akin to systems art, and is in alignment with artists associated with the period such as Dan Flavin and Sol LeWitt. In a relatively recent interview Dan Graham commented on this disposable nature, describing how Dan Flavin would send his fluorescent lights back to the store once he had used them, and Sol LeWitt would suggest his wood structures be used as firewood after he had used them in shows. He called this concept that everything should be disposable “the utopian idea” (1999, cited in Pressplay: Contemporary artists in conversation, 2005, p. 246). We can see from this that Graham views this method of using materials as an ideal, seemingly indicating that although in the case of most systems art material objects are

necessary to their taking place, once they no longer act as a component of a wider system and facilitate something to happen, their artistic value is in many ways lost.

This demonstrates part of the difference between systems art and other material or traditional artisanal art forms. Take a painted portrait for example. A replica could be produced in observing the original painting and copying the paint strokes. This replica however is in most cases not viewed with the same value as the original, and may be described as a forgery. Systems art on the other hand is in most instances intentionally reproducible, like Rauschenberg's paintings, and these reproductions are not viewed as forgeries. No matter how many times a systems artwork is remade, what it is there and then is always genuinely the artwork, because it is the significance of the object undergoing a process in relation to what surrounds it, and the concept or experience that this facilitates, that is significant – the first instance in which it exists is equally as valuable as the last. Without becoming embroiled in a discussion about issues surrounding mechanical reproduction and aura, traditional paintings can now also be reproduced infinitely as digital and printed images, viewable anywhere at any time, regardless of the location of the original – this, it might be said, reduces its value. Systems art on the other hand, in most cases and in all of those we will discuss here, requires a direct presence and relationship between artwork and viewer, and presents to the viewer an experience unique to a specific time and space. A comment made by Nicolas Bourriaud in *Relational Aesthetics* (1998, p. 61) might sum this point up efficiently:

> The aura of art no longer lies in the hinter-world represented by the work, nor in form itself, but in front of it, within the temporary collective form that it produces by being put on show.

Although located in a more socially-oriented sphere, Bourriaud's claim that the value in the artwork is located within the "temporary collective" seems to be in agreeance with what we have claimed thus far – that a systems artwork is a sum of its parts, and that it is what happens in a unique time and space as a result of this system existing (not only the physical aspects of the system itself) that is of value.

Rauschenberg's alignment with systems thinking is likewise appropriate when we consider Burnham's claim that "Conceptual focus rather than material limits define the system" (1968, p. 32). From this we could say that although material aspects of the systems artwork are important and predominantly imperative for a system to actually exist as an artwork, it is not this materiality which defines it. Ultimately, the mark of systems art is the distinctive experiences that it facilitates and what *happens* over the course of its exhibition. In the case of the *White Paintings*, we can see that the object is what allows the viewer to observe subtle aspects of their surrounding environment. Indeed, it might be suggested that Rauschenberg's work is as much about the viewer observing the white surface of the canvas, as it is about the white surface enabling the multiple experiential possibilities of observation. The canvases themselves are not enough to define the artwork, they must be considered

in relation to the viewer and the environment that contains them (and which they partly constitute). Hans Haacke goes some way in illustrating this, commenting in his 1967 statement that:

> …elements or components interact so as to arrive at a joint goal. To separate the elements would be to destroy the system. Outside the context of the whole, the elements serve no function.
> (Cited in Grasskamp, 2004, p. 102)

So while the object is demonstrated here to be in many places vital and does have significance within a systems context of art, it is important to recognise that it also stands in a processual relationship to its own surroundings, and there is little worth in it the work being positioned as an isolated unique or original object. This is not to diminish the value of the object at all, only to suggest that the way in which Rauschenberg values the object and places it in relation to its surrounding environment and viewers is somewhat aligned with systems philosophies, therefore allowing us to consider the *White Paintings* as an early form of systems art.

The Relationship between Artwork, Viewer and Environment

Both works, although especially Cage's, embrace the fact that it is to some extent unknown what will happen as the pieces are exhibited/performed:

> The score constructs a time within which to hear chance sounds, just as the *White Paintings* provide a reflective space in which to observe fleeting images.
> (Frieling, 2008, p. 82)

This lack of direct control on the part of the artist is also an attribute of systems art, with control often handed over to the environment or even more specifically to the viewer. For Cage, the period of time in which the viewer observes silence is fixed, but he does not have control over the sounds that might occur during that period of time, and no matter how many times it is performed, it will never happen or be experienced in exactly the same way. The *White Paintings* are slightly different in this sense – they are looser in that the viewer makes decisions which determine how long they spend viewing the paintings, but they are also more limited in that the effects of the environment on the painted surfaces are far more subtle. They do however still exhibit this notion of chance. Every time they are exhibited the environment is different, and so the way that the light falls and the resulting shadows will also present, even if only slightly, different effects. It is controlled to a point, but the effects of the environment it is within cannot be managed entirely.

But is it Systems Art?

Systems are created here between the environment and viewer in a way that they continuously exchange with one another. They are both focused upon the concept and undertake processes in a way that no two people could have the same experience. They are in some sense conceptual works, but they likewise draw attention to environmental, systemic embeddedness, and the specificity of material

situations. Even in the case of *4'33"* where a period of time for listening is defined, no two people can have the same experience, as every person occupies a different location and perspective within the space. It is also impossible for either artwork to really be considered complete without the interdependence of the viewer and their surrounding environment – without the viewer, no actual experience is manifested or instantiated, and in the case of *4'33*" nothing is heard. Whilst this is perhaps true of any artwork, *4'33* and the *White Paintings* could be said to strongly assert these facts. Placing Burnham who values conceptual focus, systemic embeddedness and what happens processual, over the existence of any withdrawn, insular or closed material artwork, alongside Rauschenberg and Cage, with their later interest (and participation) in bringing together art and technology, it does not seem unreasonable to suggest that such works might be considered very early examples of systems art.

A Naturalistic and Environment Dependent Systems Artwork: Hans Haacke's Condensation Cube

A Perspex cube is filled with a small amount of water. Dependent on the temperature of the environment, condensation is formed and runs down the inner surfaces of the cube. The water then returns to the pool at the bottom to allow the process to continue infinitely. Hans Haacke's *Condensation Cube* (1963-5), as shown in Figure 6, is a seemingly simple but excellent example of the philosophies present in most systems art, and is widely referenced within material surrounding the period, as well by Burnham himself. In fact, Haacke's water boxes were some of the few artworks that Burnham did not entirely reject in his concluding, more sceptical text, describing them as having "some artistic validity" (1980, p. 1). The cube is described by Haacke (2003, cited in Galanter, 2003, p. 265) as a "living organism that reacts in a flexible manner to its surroundings". This is demonstrated by the dependence it has upon its surrounding environment, and in fact, most systems artworks could be described as such.

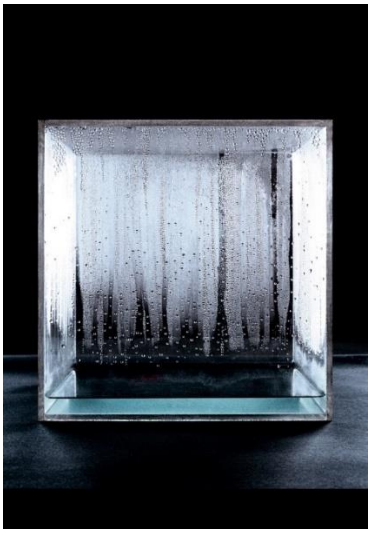

Figure 6. Hans Haacke's Condensation Cube (1963-5)

At the point of exhibition, the cube exists autonomously – a focal intention for Haacke, was the cube's ability to act freely, in open, systemic terms (Haacke, 2003, cited in Galanter, 2003, p. 265). It is entirely dependent upon changes in its surrounding environment, happening in real-time. From this we can develop a very general definition of the systems artwork– *something with a dependence upon the environment that contains it*. The following statement, written for one of Haacke's 1960s exhibitions, articulates his intentions when making artwork:

> …make something, which experiences, reacts to its environment, changes, is nonstable…
> …make something indeterminate, which always looks different, the shape of which cannot be predicted precisely…
> …make something, which cannot "perform" without the assistance of its environment…
> …make something, which reacts to light and temperature changes, is subject to air currents and depends, in its functioning, on the forces of gravity…
> …make something, which the "spectator" handles, with which he plays and thus animates it…
> …make something, which lives in time and make the "spectator" experience time…
> …articulate something natural…
> (Haacke, 1965, cited in Grasskamp, 2004, p. 100)

Haacke's choice of terminology gives us an understanding of his intentions, and can aid in understanding the viewpoint of other artists practicing during the same period. Noting Haacke's use of concepts such as "reaction", "experience" and "change", we can see how Haacke's definition of the systems artwork is akin to Burnham's. There are noticeable similarities in the use of phrases like "atmospheric conditions", "life cycle", and in the concept that both invisible and visible aspects of artwork are of equal value. It is important to recognise that despite his artistic work as a sculptor, in theorising systems art, Burnham approaches systems art predominately from the position of a writer, distanced from any specific case of art production and taking a wider, more general view. He considers systems on both a large scale (in an institutional sense), and a smaller scale (in specific artworks). Haacke on the other hand approaches the systems concept here entirely from the position of an artist, focusing more directly and more qualitatively upon the specific artwork, whilst avoiding wider meta-theoretical generalisations.

The Role of the Viewer in Condensation Cube and Systems Art

In Haacke's 1967 untitled statement, it seems important to him that the viewer does not participate emotionally in the systems artwork, and he goes as far to suggest that some systems artworks can exist autonomously, without a viewer at all. This is not to say that he doesn't believe that the viewer should participate physically with the systems artwork, and it does not mean that systems artworks that *can* exist without the viewer are not affected by the viewer's presence. In his statement, Haacke considers the viewer's role within the systems artwork, commenting that it "might be reduced to being the source of physical energy in works conceived for viewer participation…Or his mere presence might be sufficient" (cited in Grasskamp, p. 102), emphasising the importance of physical process

over and above the mental, subjective, or emotional. This is distinguished from the viewer's role in relation to what Haacke terms the traditional artwork, in which the viewer often expresses an empathetic or emotional response to an object.

Towards the end of Haacke's untitled statement, he comments that systems art has "become a partner of the viewer" (cited in Grasskamp, 2004, p. 103) – the word partner seemingly indicating a kind of symbiosis - the idea that artwork and viewer work together in some way. This could lead us to the view that Haacke ultimately positions artwork and viewer on the same level. It seems likely that, given Haacke's interest in naturalistic systems, he would consider the viewer (or human) in this sense, as a system in the same way as the artwork itself. *Condensation Cube* stands, rather like Rauschenberg's *White Paintings*, stands as one of the more subtle approaches to audience interaction. They each in some sense function as traditional objects – but they are objects which perform processually and which arguably begin to subtly integrate the viewer. In this sense they serve to demonstrate one of the archetypal aspects of systems art philosophies - and Haacke's work has the additional accolade of having been accepted by Burnham in amidst his sweeping rejection of the systems approach and a large intersection of systems art.

The systems approach stresses the interdependence between the visual, aural, physical or otherwise sensed exhibited material and the environment it is within – including the viewer. What unites the artworks that will be discussed hereafter is firstly their systems-basis, and secondly their increased systemic integration of the viewer as a component. Although the previously mentioned artworks do integrate the viewer in some sense, the works we will discuss here utilise the viewer's presence in a more direct fashion, allowing the viewer to observe themselves within the work in some way, and in some cases utilising them in as a kind of performer. In many ways, everything about these artworks could be said to depend upon the viewer. Unlike more typical interactive art (Rafael Lozano-Hemmer's installations for example), which invites a direct, controlled and intentional interaction from the viewer, systems art could be said to do the opposite, only allowing the viewer to observe the consequences of their presence. No direct interaction is required or invited, and the state of the artwork is not affected by the viewer in a controlled manner. Instead, interaction on the part of the viewer is unintentional and incidental, requiring little thought or direct input from the viewer other than their presence. In some cases, the viewer may even be unaware they have acted as a component. Here, we will focus on other artworks produced during the 1960s and 70s, focusing further on the viewer as a component, considering how this plays a part in the systems approach.

Dan Graham and Bruce Nauman's Camera Installations

Dan Graham and Bruce Nauman's camera installations produced during the 1960s and 70s have many commonalities and overlaps; their use of technology, the way that their environments are arranged, how they utilise the viewer as a component, and how they are contextualised. The two became

grouped together during this period, as both were interested in the "subjectivity of the spectator" (Graham, 1999, cited in Pressplay: Contemporary artists in conversation, 2005, p. 248) and seemed to focus upon self-perception and observation (Kwastek, 2013, p. 24). In the context of environments which use combinations of cameras, mirrors, microphones and television screens, the viewer is presented with situations in which they are not only play the role of the viewer, but also that of the subject – in a similar sense to a comment made earlier when discussing Rauschenberg and Cage, the audience both creates and experiences simultaneously. In so doing, they become components of a constructed system, simply by entering a space.

With a broad and eclectic practice including writing, performance, video, installation, curating and architecture, Graham first came to attention in the 1960s and is still making work today. Nauman's practice had a slightly narrower range, being focused mainly on sculpture and performance initially with himself as the main performer, until 1969 which saw him take a performative step back and begin to utilise the viewer as performer. Graham's work has been described as tracing the "symbiosis between architectural environments and their inhabitants" (Lisson Gallery, n.d.), while Nauman has been described as "director of the viewer's experience". (Cross et al., 2004, p. 16) These descriptions should serve to signpost the way in which how Graham and Nauman might fit into this discussion - we will focus here upon artworks which see the viewer utilised as a component of a system and which have a focus on self-perception and observation.

We will firstly provide an overview of Graham and Nauman's approach, before we discuss and compare them through the lens of systems thinking. Graham's *Public Space/Two Audiences* (1976) (Figure 7) was included in Tate's *Open Systems* exhibition, which is partly the reason for its inclusion here. Like many of his later artworks, including his pavilions which he is still making and exhibiting today, this piece does not involve the use of technology. Graham's installation, consists of two rooms separated only by a two-way mirror. When viewers enter each space, they are able to view themselves as well as the people on the other side of the mirror. A situation is created in which the process of viewing and the viewers themselves are the subject.

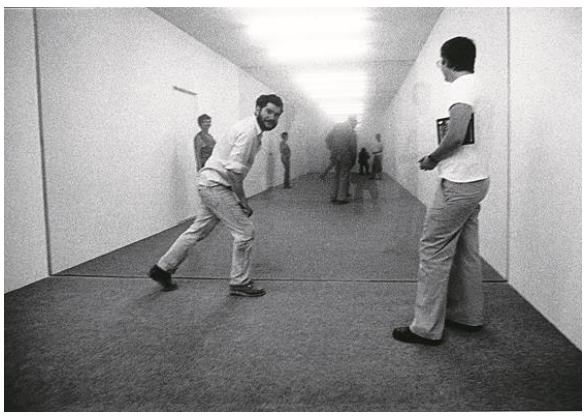

Figure 7. Dan Graham's Public Space/Two Audiences (1976)

Extending this concept, *Present Continuous Past(s)* (1974) uses mirrors and video recording to create a somewhat disorientating situation with the viewer at the centre. On entering the space, the viewer can see themselves in the mirrors on the wall to the left and directly in front of them. Unbeknownst to them, they are also being filmed by a camera situated on the wall on the right side of the space. After eight seconds, the recording is played and the viewer is then able to see a video recording of themselves slightly dislocated in time being played back on the TV screen. As the screen and camera face the mirror, the camera then subsequently records previous recordings as well as continuing to record the viewer's present actions in the space, creating an "infinite regress of time continuums within time continuums" (Hall and Fifer, 1990, cited in Media Kunst, n.d.). The viewer can then witness themselves in several time-frames at once - in present time in the mirror, eight seconds ago on the screen directly in front of them, and sixteen seconds ago on the screen captured in the background.

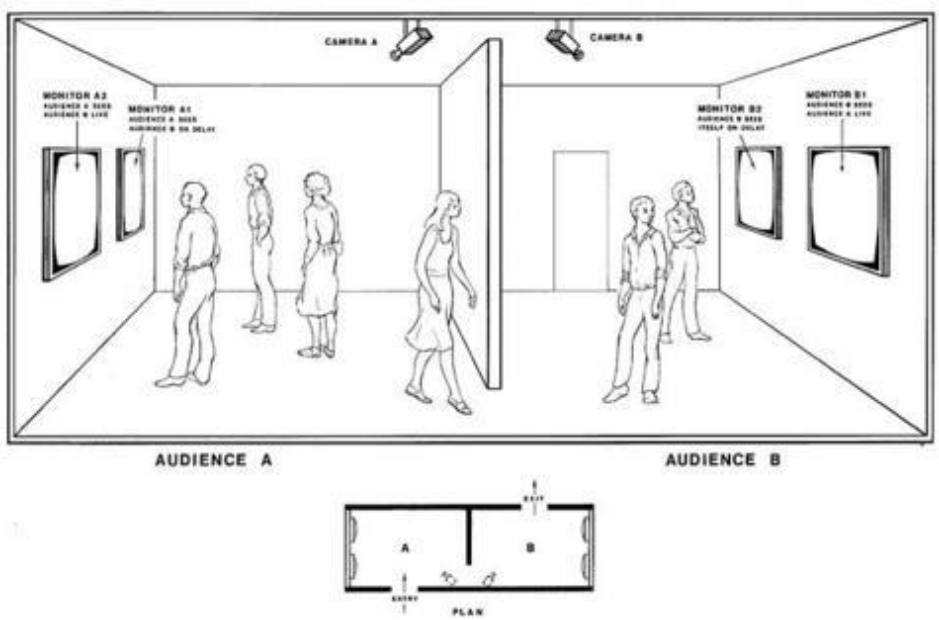

Figure 8. Dan Graham's Time Delay Room (1974)

Time Delay Room (1974) might be seen as a synthesis of the previous works and has been exhibited with variations by Graham several times. The basic premise of the installation is to provide two audiences in two adjoining spaces the facility of viewing themselves, whilst also viewing each other. A concept diagram can be seen in Figure 8. The installation can consist of two or three rooms, containing a combination of screens, cameras and sometimes speakers. What appeared on the screens changed with each variation that Graham produced. In one variation, each audience could view the opposite audience, live on one screen and with an eight second delay on the other. In another variation, the audience could witness themselves live whilst viewing the other audience with a delay – Graham experimented with a variety of combinations of time delays and video perspectives. It was also possible for viewers to move from room to room via a corridor – in doing this, the disorientation amongst the time continuums were further disordered as the viewer may have been able to witness

themselves in the past and present at the same time, depending on the videos displayed. Graham further developed the piece by incorporating a performer who observed the audiences and described their actions vocally – this was played as live audio in the same spaces as the screens and audiences.

Moving on to Nauman's works, we can start to observe some parallels. *Going Around the Corner Piece* (1970) consists of a large white cube, with a TV and camera positioned on each corner. As the viewer walks around one of the corners, they see themselves doing so on the screen in front of them shot from the perspective of the camera positioned behind them. In a fashion similar to Graham's time delay video installations, the viewer witnesses their just-past actions within a short time frame, flattening temporalities, varying perspectives, and producing a general sense of disorientation.

Figure 9. Bruce Nauman's Live/Taped Video Corridor (1970)

Live/Taped Video Corridor (1970) (Figure 9) does something similar. Two TV screens are positioned at the end of a narrow corridor, one screen shows a pre-recorded video tape of the empty corridor, whilst the other shows a live recording of it, from a camera positioned at the entrance, facing the screens. As the viewer approaches the screens they can observe themselves walking from behind, getting smaller as they reach the screens and as their distance from the camera increases. As the viewer walks back down the corridor, the screen shows them facing forwards, growing larger as they approach the camera. However, at no point are they able to see themselves from the front due to the reversed camera angles. As with Graham's work the viewer becomes the subject through self-observation, facilitated by the pre-existing components of the systems. At the same time, however, Nauman's work induces a sense of depersonalisation or dissociation – a feeling of self as other that arises through the inability to directly confront, or to face one's image.

Viewer as Component, Artwork as Experience

It should be very much apparent that the viewer is entirely at the centre of Graham and Nauman's works. When conceiving and making these installations, the viewer is at the forefront of the artists mind. Graham and Nauman must consider the way in which the physical components (cameras, mirrors etc.) will act with the viewer in an interdependent fashion, and how this will alter the viewer's experience. In the context of exhibition, the role of the viewer is paramount – indeed the provision of the audience completes the system. Just as the physical components are a vital requirement if these systems are to function as intended, so equally is the viewer. Of course, the physical components can exist and function to some extent without the viewer's presence, and do so when lacking a viewer in an exhibition context. When the system is dormant and lacks a viewer, the intended concepts are lost and the physical components - reduced to a state of potentiality - have little or no meaning.

Graham and Nauman's installations lead to questions surrounding the role of the viewer, but also questions of the self, the social, and the temporal. Whilst Graham and Nauman's works are in many ways alike and productive of similar outcomes they diverge over issues of individuality and the collective. That is to say, Graham's work would appear to exhibit a stronger concern with viewers collectively - inducing multiple experiences simultaneously. Nauman, on the other hand, has a greater hermetic focus – addressing experience on a singular level, making artworks which appear to only accommodate one person at a time. According to Katja Kwastek (2013, p. 25), Graham's work attempts "to create a link between the recipient's self-perception and neuronal and cognitive processes of awareness", whilst Nauman's stands as an example of "extreme recipient conditioning", both controlling and keeping the viewer under surveillance through the use of "spatial structures and media-based strategies". When seen from a processual, verb based perspective, however, Graham and Nauman's artworks are united in their concern with happenings, with a focus upon the "perceptual process" (Graham, 1999, cited in Pressplay: Contemporary artists in conversation, 2005, p. 248).

Viewing these works from a processual perspective, the viewer becomes as much a part of the artwork as its material components, entering an environment which both houses and acts as a component of a system, they (at first unknowingly) become systemic components. However, through witnessing the past/present and several visual perspectives simultaneously, their position as a component is disclosed. Thus, the way in which these temporalities and perspectives are flattened, reveals the processual nature of the work in the context of its construction and exhibition. A symbiotic relationship is formed – and a feedback loop is established between the viewer's experience and other components of the system. In Graham and Nauman's works, the viewer is captured and re-presented visually, resulting in a kind of self-observation that simultaneously alters their experience.

Artist and Viewer Control

Graham's rooms could in some ways be viewed as social experiments, due to the way in which he experiments with the viewer's role and with interaction between audience members. Graham varies the parameters of his experiments, introducing subtle nuances into each work. Thus he develops a general concept whilst altering particular properties in order produce different kinds of experiential feedback. It is through a similar experimental process that Nauman produced a series of corridor works, altering parameters such as camera angles and the spatial arrangement of the corridor. In one work Graham removed the walls of the corridor entirely, although interestingly, despite this architectural freedom the viewer is said to still interact with the piece as if still confined by walls, the cameras and screens acting "like the strings controlling a marionette" (Cross et al., 2004, p. 16). This serves as an example of the "recipient conditioning" mentioned earlier, and it provides a useful starting point to discuss control on the part of the artist and viewer.

Thus far we have focused upon a renouncement of control on the part of the artist. However, in some instance control is not entirely relinquished – instead, a work may experiment with limiting levels of control for both artist and viewer. Thus, in the case of Graham and Nauman, the viewer develops a heightened awareness of their role, but this is presented to them in a somewhat limited fashion. That is to say, they are only able to observe themselves and their position, and are unable to directly interact or control aspects of the artwork. In contrast, the artist, when making the work, has complete control over the arrangement its elements in terms of the positioning of components and timing of cameras. However, once the piece is exhibited, control is relinquished to some extent - the artist no longer has any direct effect on the state of the work or how the viewer experiences it. Nauman does however appear to retain a level of premeditated architectural control over the viewer. According to Cross et al. (p. 16), Nauman's corridor works are "the stage set upon which the artist would manipulate the viewer's actions and experience", acting as an arena for a performance to take place. This word "manipulate" paired with the previously cited description of the viewer as a puppet, indicates that it would not be wrong to think of Nauman as employing a level of indirect influence over the viewer.

A system is nevertheless constructed in which some or all elements are decidedly dependent upon external factors – in these cases, the viewer is the main external factor but environmental changes also play a part. At the point of exhibition, the artist has little to no direct control over the viewer or environment. They can, however, predict what may happen to a certain extent, and it is this that it seems Graham and Nauman do. Haacke, for example, knows that as the temperature in the surrounding environment of *Condensation Cube* rises and falls, that the process of evaporation and condensation happens within the cube – he does not, however, have any control over the temperature in the environment. Angela Bulloch knows that her drawing machine (which we will discuss shortly) will be affected by the presence of the viewer seated in front of it, but she cannot control the

likelihood that anyone will actually sit down. Graham and Nauman know that the viewer will incidentally become a component of their systems but they cannot entirely control the way in which they respond – although the way they position the physical components of their works does result in a set of environmental affordances that act as a guide for or direct the viewer in some way.

Contemporary Systems Approaches

We have seen how in the case of Graham and Nauman, the viewer is able to literally observe themselves (through video documentation), and as a consequence, their position in the work is eventually, if not immediately, clear to them. Particularly in the case of Graham's installations, it was suggested that they could be viewed to some extent as social experiments, particularly in that they focus on viewers as a collective, and appear to attempt to induce an experience in which viewers interact not only with the physical or visual components within the art environment, but with each other. With this in mind, we will now move to discuss Nicolas Bourriaud's *Relational Aesthetics* (1998) a theory with a focus upon social relations in art, which, as it already been mentioned, would appear to be indebted to or adopt a systems aesthetic in some ways. It will be suggested that *Relational Aesthetics* goes some way in demonstrating an embeddedness of systems in art and society today, but that it also in presents a systems view that is in some sense overly narrow in so far as it only focuses upon social interaction as a significant form.

A New Systems Esthetic? Nicolas Bourriaud's Relational Aesthetics

There is a sense in which Nicolas Bourriaud's *Relational Aesthetics* can be viewed as adopting a kind of systems approach. Indeed parts of Bourriaud's work seem to run in parallel with Burnham's "Systems Esthetics", and many of Bourriaud's claims in *Relational Aesthetics* are strikingly similar to claims made by Burnham thirty years earlier. For instance, Bourriaud suggested that in the 1990's, the goals of modern art were changing and he drew attention to the way in which artistic practice was now "taking as its theoretical horizon the realm of human interactions and its social context, rather than the assertion of an independent and *private* symbolic space" (p. 14). In Bourriaud's view the static art object in the traditional sense induced a singular, somewhat detached viewing experience, and in contrast he placed higher value on people and their interactions with each other, claiming that this suggested a new set of socio-relational goals with respect to artistic production:

> Unlike an object that is closed in on itself by the intervention of a style and a signature, present-day art shows that form only exists in the encounter and in the dynamic relationship enjoyed by an artistic proposition with other formations, artistic or otherwise.
> (p. 21)

Bourriaud describes *Relational Aesthetics* as a "theory of form" (p. 19) but qualified this with the suggestion that it may be more appropriate in the context of contemporary art to discuss "'formations' rather than 'forms'" (p. 21). This rather telling distinction goes some way towards demonstrating the

way in which Bourriaud's position is resonant with Burnham's systems view. That is to say, the emphasis upon *formation* suggests a vision of interconnected, multiple entities, and urges a dynamic, verb-oriented perspective, which might be contrasted with the more traditional isolated and static notion of *form*. In Bourriaud's work, there is, however, an emphasis upon peculiarly human interactions. That is to say, he tells us that "artistic practice…resides in the invention of relations between consciousness" (p. 22) – and it seems significant that Bourriaud's formations ultimately would only seem to come into play with the introduction of specifically human participants (p. 22). There are clear similarities between some of Bourriaud's claims and some of Burnham's earlier assertions – and this is perhaps most apparent when we consider Burnham's suggestions, firstly that a systems artwork can contain people, ideas, and messages; secondly that we should be less focused on things, and more focused upon the way that things are done, and lastly that a systems artwork is defined more by its conceptual focus than by its material limits. Thus, we can see how, when considered from a purely socio-cultural perspective, the thought processes of Burnham and Bourriaud might seem to align. It is, however, the almost exclusively social orientation of Bourriaud's theory, which serves ultimately to distinguish *Relational Aesthetics* from Burnham's "Systems Esthetics". That is to say, whilst there is a sense in which Burnham's systems approach remains more firmly positioned within the institutional space (Burnham focuses primarily upon works that can be exhibited in an institutional setting), it could nevertheless be said to operate with a more diverse, and more encompassing relational spectrum than that of Bourriaud. Thus, whilst there is a sense in which Bourriaud's *Relational Aesthetics* can be applauded for its sensitivity to external relations – for the way in which it takes art outside of the institutional context and for the way in which it questions the boundaries of the white cube space, it is clear that Burnham, despite his focus upon works exhibited within the institution, nevertheless recognises the significance of other, non-human materials, entities and relations (hence the emphasis upon technological relationships in his work). It does seem odd, however, that in spite of its wider exploration of interaction of an environmental, material and technological scale, systems art rarely seemed to leave the institutional setting – this may have been related to the theoretical context of the time, when institutional theories of art were proliferating. It is as if Burnham was engaging with some of the themes of George Dickie, Nelson Goodman and Arthur Danto's notions of Institutional Art[5], whilst seeing them through the lens of an alternative, technological metaphor.

We have seen how Burnham approaches art production with a focus upon technology (concentrating on an interdependence between people and most often technological objects), whilst Bourriaud approaches it almost entirely from the perspective of the social and the cultural (with a more specific focus on interactions between people, which are sometimes - though not exclusively - mediated by

[5] Theories of Institutional Art developed by Dickie, Danto, and Goodman, suggest that it is the institutional context of the art world which defines and validates what constitutes an artwork.

objects). Reflecting once more upon Graham's social artistic experiments, we might identify further resonance between Burnham and Bourriaud's ideas. As we have seen, Graham's installations make use of material components (technology and the material architecture of a space), but they are always employed in the context of some form of experimentation with social interaction. It seems clear, however, that both Bourriaud and Burnham are nevertheless concerned with analysing "the formal or structural characteristics of interactions" (Kwastek, 2013, p. 58), and that they have similar aims in so far as they are both concerned with the ways in which entities (whether people, physical components, or a combination of both) form relations, and therefore exist as systems in some form. In relation to a discussion of the development of his theory, Bourriaud (p. 44) comments that it arose "from an observation of the present" (the 1990s) suggesting that:

> Its basic claim – the sphere of human relations as artwork venue – has no prior example in art history, even if it appears, after the fact, as the obvious backdrop of all aesthetic praxis (p. 44)

Taking Bourriaud's acknowledgement that human relations may appear an "obvious backdrop of all aesthetic praxis" even if not overtly represented in art history, alongside the comment that his theory developed through simply observing the present, it could be said that a systemic, relational undercurrent in art and society had been present for a long time, and it is in theories such as Burnham's "Systems Esthetics" that such an undercurrent had been identified.

Bourriaud's positioning of the Art Object

Neither Burnham nor Bourriaud entirely reject the art object. Instead, they present alternative ways of positioning and evaluating objects of a systemic and relational nature, alongside the more traditional art objects of painting or sculpture. We have already seen how from a systems perspective the concept might be favoured over the material, and how ideas of material value, originality and uniqueness have less gravity. The physical components of systems are nevertheless significant in so far as they are required to facilitate a process – whether that be Rauschenberg's white canvases, the piano in Cage's *4'33"*, or the cameras and TV screens in Graham and Nauman's installations. Although Bourriaud discusses works which often do not have material form in the sense of an object, he highlights that he does not celebrate immateriality, and that questions of immateriality do not impact significantly on the aims of relational art on the whole. Rather, his focus lies in the ability for art to "produce a sense of human existence" (p. 53), regardless of its physical or non-physical form. Bourriaud addresses the position of the object to some extent:

> …objects are an intrinsic part of the language, with both regarded as vehicles of relations to the other. In a way, an object is every bit as immaterial as a phone call. And a work that consists in a dinner around a soup is every bit as *material* as a statue. (p. 47)

We can see that Bourriaud does acknowledge that the object is often necessary, describing it as "intrinsic", but goes on to suggest that something that is purely processual should not be considered as having any less reality. In so far as he materialises entities such as speech, movement, and general human interaction, which are more typically positioned as having immaterial qualities, Bourriaud could be said to formalise the relational, as art matter. This raises the question as to whether Bourriaud genuinely places any real importance onto the object, despite acknowledging its place. Arguably, material objects play a more significant role in the context of Burnham's systems approach, as components in a system. The question of materiality is seemingly less relevant for Bourriaud, as long as human relations are in some way constructed. There is a sense in which the quotation above in some way seems to mirror another of Burnham's comments in "Systems Esthetics" – namely that the visible and invisible should be viewed with equal importance (Burnham, 1968, p.35). Whilst it is clearly the case that there are interesting resonances and overlaps between their respective positions on objects and materiality, we have seen how Burnham is nevertheless more receptive to the role of objects within systems, whilst Bourriaud's sole emphasis is on the production of participatory (human) relations.

The anthropocentricity of Bourriaud's position is revealed in his claims that, "Any artwork might thus be defined as a relational object, like the geometric place of negotiation with countless correspondents and recipients" (p. 26). Again we see here that Bourriaud is less concerned with the actual material nature of the object, but rather with the human relations it facilitates, and the way in which it acts as a "place of negotiation". Importantly, for our purposes here, Bourriaud is concerned with the production of masses of human relations both inside and outside the institutional space of the gallery. Again there are resonances with Burnham's view that the object should be considered part of a wider system of processes, but again there is a difference in relational focus.

As well as drawing attention to the way in which the artwork might be seen as a mixture of social, physical and technical processes, Burnham focuses on the idea that the object itself has a processual relationship with its environment – largely through consideration of its gradual deterioration. Burnham is as sensitive to the internal relationality of a work as he is is to the operation of its immediate, environmental exterior relations – and this perhaps goes some way to explaining his institutional focus and his receptivity to traditional venues of exhibition such as the gallery. In contrast to this, Bourriaud's writing is focused more solely on a broader form of external relationality – *Relational Aesthetics* is concerned with a more expansive external relationality, extending beyond the art world, the art object, the gallery walls and traditional venues of exhibition. Thus Bourriaud rejects – or at least passes over - the hermetic internal qualities of the artwork, which in being less likely to participate in the formation of social relations are ultimately less productive from the perspective of *Relational Aesthetics*.

The Role of the Artist and Viewer in Relational Art

In 2002, Bourriaud curated an exhibition at the San Francisco Art Institute entitled *Touch: Relational Art from the 1990s to Now*, which included work by artists such as Angela Bulloch, Liam Gillick, Gillian Wearing and Carsten Höller. According to Moss and Bourriaud (2002) the artists included "initiate new relations…between artist and onlooker and between art and the world" through "systematically transforming everyday activities outside of their mundane and private spaces". In the catalogue for the exhibition, Bourriaud makes the statement that the artist acts as "…script writer or script editor of the social movie" (Moss and Bourriaud, 2002). This once again foregrounds the social dimension of *Relational Aesthetics*, but also recalls the earlier suggestion in these pages that Nauman might in some sense be positioned as a "director", with his artworks acting as a "stage" for the viewer to perform. We likewise noted that there are varying levels of directorship that it can be undertaken in a loose, improvisational sense, or it can be regimented, employing high levels of control. We saw how Graham and Nauman could be taken to institute various levels of control, and we saw how there are productive tensions between participatory freedom and directorial constraint that condition their respective works. Bourriaud's description of the artist as script writer would seem to emphasise an improvisational openness to a situation, and a loosening of constraints. That is to say, Bourriaud considers the way in which situations, once set up, or brought into being, allow for a broadly improvisational social performance - providing the loosest of stage directions.

Earlier we drew attention to the stress in Bourriaud's work on the role of human interaction along with the formation of "relations between consciousness". Accordingly, we might suggest that in the case of relational art, the concept of the artwork is built around the human-centric viewer-participant. In terms of systems art however, the viewer-participant, although considered integral in some works, is not universally required and there are some works which do not require human participation (Haacke's *Condensation Cube*, for example), With reference to the idea that the viewer is integral to the relational work, Bourriaud comments that:

> The exchanges that take place between people, in the gallery or museum space, turn out to be as likely to act as the raw matter for an artistic work.
> (p. 37)

Describing the relations that form between people as the "raw matter", stands as a broadly anthropocentric thesis. In many cases, the artwork is entirely dependent upon people. Relational art is not always considered performance, but can be likened to it, particularly with respect to its ephemerality – in the way that it is only available for certain periods of time (Bourriaud, 1998, p. 29). Once the performative moment has passed, the work ceases to exist other than in the form of documentation - which must be distinguished from artwork itself. The temporary, fleeting character of relational works further highlights the utilisation of the viewer, and their role in actually instantiating or determining the existence of the work. Systems art could be said to have a similar ontological

status – in not being exhibited its existence is similarly problematic - its physical components take on object status and simply become parts – for example, when Graham and Nauman's camera installations are not on show, the cameras, extricated from these systems, are simply cameras once more. This does, however, serve to demonstrate systems arts' wider purview - the way in which it goes beyond human relationality to address a broader range of physical and technological, components which contribute their own processes to a system. Previously we considered the way in which the camera installations by Graham and Nauman, may exist in a physical form (as a systemic-camera installation) and may only require *activation* by the viewer. We have seen how for the most part systems art almost always contains physical components which have been combined in a systemic fashion and how its less anthropocentric focus enables a broader spectrum of relationality than that which is typically encountered in *Relational Aesthetics*. In summary, we have seen how in the case of both systems art and relational art a systemic, interdependent relationship is in some way formed, but that the exclusively human focus of relational art distinguishes it from systems art. In systems art, the viewer-performer is often utilised and does in many cases undergo some form of social experience, but this is not the intended emphasis, and as a consequence systems art typically embraces a wider range of components and processes.

A Contemporary Systems Perspective: Actor-Network Theory

Demonstrating his expansive, anti-institutional perspective, Bourriaud comments:

> It seems possible, in our view, to describe the specific nature of present-day art with the help of the concept of creating relations outside the field of art…relations between individuals and groups, between the artist and the world, and, by way of transitivity, between the beholder and the world.
> (p. 26)

In this sense, we can understand the scale of Bourriaud's anthropocentrism. It seems clear that whilst Bourriaud begins with small, location specific interactions, he nevertheless gestures towards the all-encompassing character of relationality. Despite this acknowledgment of relationality's reach, for Bourriaud, the specifically human is always implicated, and there is a sense in which Bourriaud would fail to acknowledge the role that non-human entities (i.e. objects, weather, and economic forces) must play in a genuinely relational philosophy.

In contrast to this, Bruno Latour and John Law's Actor-Network Theory – a widely applied relational approach which explores "the interconnectedness of all things" (Mayhew, 2015), might be seen to extend Bourriaud's human-centric, somewhat parochial approach, in a direction that seems compatible with Burnham's "Systems Esthetics". As Law has noted with reference to the kind of social relationality that underpins Bourriaud's position:

> If human beings form a social network it is not because they interact with other human beings. It is because they interact with human beings and endless other materials too. (Law, 1992, p. 382)

Actor-Network Theory has been propagated by Law from a sociological perspective, and Latour from the perspective of science and technology studies (a socio-scientific perspective). The theory suggests that all entities, both human and non-human should be considered in agential terms within a system, thus levelling the status of systemic components, and proposing a universal interdependence amongst all entities. The actor (or "actant" to use Latour's term) can assume any form, and must ultimately be considered in a verb oriented fashion, as anything that *does* something, which forms relations with something else. The actor-*network*, is the system of relations that are formed between actors to create a dynamic network of interrelatedness (Jackson, 2015). This flattening of actants expresses the idea that, "entities take their form and acquire their attributes as a result of their relations with other entities" (Law, 1999, p. 3) and so no entity can be viewed with higher value, or isolated from others. Actants can only be viewed in relation to what surrounds them, and this results in a more equitable distribution of significance. Latour also notes that from the perspective of relationality, concepts such as distance, scale, and boundaries are flattened – no position can be isolated or removed from an actor-network, and physical proximity becomes irrelevant as it is only connection that is of importance - in this sense questions of scale dissolve, "…a network is never bigger than another one, it is simply longer or more intensely connected" (Latour, 1996, p. 371).

The True Successor of Systems Esthetics?

Actor-Network Theory and "Systems Esthetics" both flatten relationality amongst all entities, positioning the existence of everything as systemic in some way. In this sense, they embrace a broader notion of agency than is suggested by Bourriaud. That is to say, they suggest a picture of agency, which encompasses the human and non-human, whilst privileging neither. Actor-Network Theory has elements in common with the approaches of both Burnham and Bourriaud, though it appears to be more an extension of Burnham's "Systems Esthetics" than anything else. It would seem that the closest parallel between Burnham's and Bourriaud's work can be found in the focus on the creation of an interdependent relationship between artwork, environment, and viewer, creating "relations between people and the components of their environment" (Burnham 1968, p. 31). In many ways, *Relational Aesthetics* takes this relational aspect of Burnham's thought, but refocuses it in purely human-centric terms. It is perhaps because of this that Actor-Network Theory, would seem to offer a more satisfying contemporary extension to "Systems Esthetics" – retaining many of the properties of Burnham's approach, whilst extending it in a trans-institutional direction. That is to say, Actor-Network Theory and "Systems Esthetics" can both be seen to flatten relationality amongst all entities and consider the way in which *everything* ultimately exists in a systemic fashion, and in this sense, they each implement a broader notion of agency that embraces human and non-human entities. However, Actor-

Network Theory, would seem to more thoroughly follow these observations through, and to be more fully cognisant of their trans-institutional implications. Thus, there is a sense in which Actor-Network Theory can be seen to go beyond Burnham's "Systems Esthetics" in so far as it encourages us to step outside of the art-world and the gallery space – embracing the anti-institutional orientation that can also be found in Bourriaud's work (relational artworks typically happen in social spaces outside of the traditional gallery setting). Despite their common trans-institutional context, Actor-Network Theory has explanatory power that stretches beyond *Relational Aesthetics*. This is because it develops its insights in a non-anthropocentric fashion (embracing a wider spectrum of agency and a wider spectrum of relationality). As such there is a sense in which Actor-Network Theory would seem to genuinely extend and develop Burnham's ideas, whilst also address a more contemporary artistic context, and it is in this sense that we might position it as its rightful heir.

We have seen how, in *Relational Aesthetics*, Bourriaud is only concerned with the relations between humans, and how he in some ways discounts the significance of non-human objects in facilitating these relations. Bourriaud's position is nevertheless valuable in so far as moves out of the institutional gallery space and into the real world, connecting (human) entities both within and outside of the institution. It has been suggested that the focus on human relationality in Bourriaud's work is however too narrow, as the agency of the non-human object or entity is not acknowledged. As such it does not allow for the all-encompassing, holistic view that is Burnham and Latour's collective aim. Thus Actor-Network Theory: "implies no special motivation of human individual actors, nor of humans in general" (Latour, 1996, p. 373). This stands in stark contrast to Bourriaud's position which ultimately views the human and their social interactions, as the "raw matter" for the artwork. Latour does not deny that humans can construct their own physical worlds, but he notes that this construction is always dependent upon other non-human "actants" (Castree et al., 2013). Thus the central claim of actor-network theory is that all phenomena contribute to the construction of the world through their interdependent relations (Castree et al., 2013). Accordingly, in the case of Actor-Network Theory and "Systems Esthetics", the agency of the artwork is viewed as existing on the same level as the audience and events that flow around it, acting as integral to their existence.

From the position of Actor-Network Theory, what facilitates the human interaction is as important as the interaction itself – any hierarchy in the value of entities dissipates. In this way, Actor-Network Theory provides a valuable extension or development of the concept of "Systems Esthetics" – it does not alter any of its values or assumptions, rather, it might be said to properly fulfil them - reaching beyond the art institution and the traditional mode of exhibition - considering a systems approach on a wider cosmological scale. Thus it is in Actor-Network Theory that we encounter the new systems aesthetic that dominates contemporary thinking, and serves as the rightful heir to Burnham's systems approach.

Angela Bulloch and Olafur Eliasson: The Intersection between Relationality and Systems

In order to unpack this idea further, we will examine some artists whose practice appears to be located at the intersection between Bourriaud's *Relational Aesthetics* and Burnham's "Systems Esthetics". Angela Bulloch and Olafur Eliasson are both associated with relational art, and could be defined as relational artists. Only Bulloch is directly referenced by Bourriaud in relation to her socially-oriented works, but Eliasson also develops a highly social practice in alignment with a relational approach, and as such might be seen to work in accord with Bourriaud's position. Bulloch and Eliasson nevertheless develop works which incorporate relations *and* systems. In the case of both artists, there are works which embrace a broader spectrum of relationality - merging the social, the technical, the naturalistic, and the technological - knitting together the social relationality of Bourriaud and the technical relationality of Burnham.

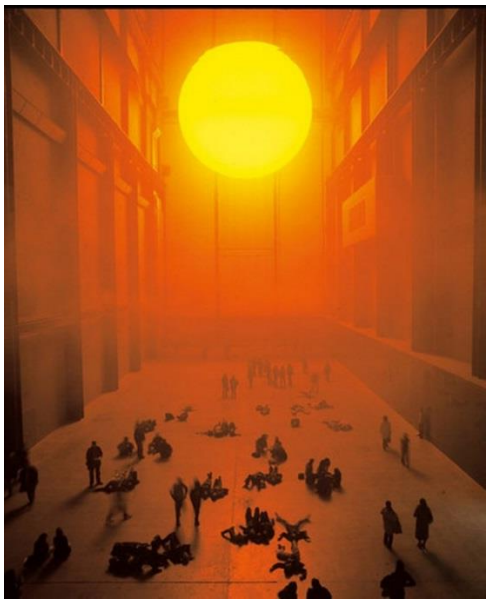

Figure 10. Olafur Eliasson's The weather project (2003-4) in the Tate Modern's Turbine Hall

The works by Bulloch which Bourriaud references are at first glance social, and human-centric in character. For instance, an untitled artwork (1993) which took place at the Centre Culturel Contemporaine in Tours, France, involved opening a café that reacted to visitors sitting down by way of playing music, and another untitled video work (1992) recorded the interactions that took place on the artist's journey to Italy where she was due to exhibit. Similarly, Eliasson's work *The weather project* (2003-4), brought people together under the gaze of an artificial sun, in the Turbine Hall of the Tate Modern, where they could observe themselves observing from a distanced perspective in a vast mirrored ceiling (Figure 10). In our discussion of Actor-Network Theory, we have already been sensitised to the non-human, rather material qualities of such works, but it is clear that such works are also intended to convey the sense of "being-together" (Bourriaud, 1998, p. 15) which stands as Bourriaud's emphasis.

Both Bulloch and Eliasson's praxis are, nevertheless eclectic in nature. Bulloch presents her practice as conditioned by her interest in, "systems, patterns and rules, as well as her preoccupation with the history of shapes and human interaction with them." (Esther Schipper, n.d., p. 1) whilst Eliasson describes his practice as being focused on "…perception, movement, embodied experience, and feelings of self." (Studio Olafur Eliasson, n.d.). The majority of Eliasson's artworks appear to build upon or replicate processes present in many of the artworks that have already been discussed in this text, however, they also introduce a social dimension that is highly resonant with *Relational Aesthetics*. Works such as: *Fog assembly* (2016) and *Rainbow assembly* (2016) make use of naturalistic processes in similar ways to Haacke; *Echo house* (2007) seems to build upon Cage's use of ambient sound in the theatre space; *Spatial vibration: string-based instrument, study II* (2008) and *Connecting cross country with a line* (2013) appear to work in similar ways to Bulloch's drawing machines; and, possibly most prominently, works such as *Self-loop* (2015), *Look into the box* (2002), and *Your felt future* (2011), experiment with the viewer's experience and their position in space in very similar ways to Graham and Nauman. Bulloch's work is similarly eclectic in socio-relational terms, but it is her drawing machines that will provide the focus for our discussion, in so far as they provide one of the clearest instances of a crossover between systems and relational aesthetics. Bulloch's drawing machines utilise systemic processes in very similar ways to the works of Graham and Nauman, but in the case of Bulloch's drawing machines, the consequences of the viewer's involvement is subjected to processes of abstraction, and transformation. As a consequence, the audience interaction in Bulloch's work becomes slightly removed and more subtle in character - to the extent that they may no longer be entirely aware of their role. Whilst it is still the case that Bulloch's drawing machines are processual and broadly representational in character – it is important to recognise that the connection between the viewer and representational image is distanced, depersonalised, and less literal.

From 1990 when Bulloch produced her first drawing machine, they have been a recurring feature feature within her oeuvre. The machines each consist of a plotter attached to an X/Y axis, programmed to respond to an aspect of the surrounding environment. *Betaville* (1996), as shown in Figure 11, is triggered when somebody sits on the bench in front of it – everytime the bench is sat upon, the direction of the line changes. *Grid Drawing Machine* (1992) is similar in aesthetic, but instead reacts to sound in it's immediate surroundings. The machines are programmed to draw somewhat randomly, but this randomness is controlled to some extent by pre-set parameters, and they require input from the surrounding environment (which often contains a viewer) to function.

Figure 11. Angela Bulloch's Betaville (1994)

When discussing her drawing machines, Bulloch comments, “The thrill of activating these big machines is tempered by the realization that they will do what they can once they are set in motion, regardless of the desires of the viewer” (Bulloch n.d., cited in Esther Schipper, n.d.). Bulloch determines rules for the machines before they are exhibited, decides what the effect the environment and viewer will have (i.e. the line changes direction), and institutes the situational trigger for this effect (i.e. the viewer sits upon a bench). At the point of exhibition, Bulloch then relinquishes control, allowing the system to function on a more independent level. At this point, a level of control is also passed to the audience/viewer. This level of control however is extremely low, and is always in some sense mediated by the initial constraints imposed by the artist - as Bulloch comments, the machines will function regardless of the viewer’s actions beyond their initial activation. It would seem that Eliasson approaches the artwork from a similar standpoint, commenting that, “For every experience there’s a set of rules or conditions, and these conditions can be set by me or by the spectators, or by other people” (Eliasson, 2000, cited in Pressplay: Contemporary artists in conversation, 2005, p. 185). Seemingly Eliasson’s approach is slightly more human-centric than Bulloch’s here, but it nevertheless involves the setting of conditions in a similar way to the drawing machines. It is this rule setting (which happens in a way similar to that within computer programming - an ‘if this happens…then do this…’ approach) which ultimately creates this symbiotic, interdependent relationship between components, and introduces a systemic nature to both technological/material and socio-relational aspects of the artwork.

Bulloch's drawing machines could thus be likened to Haacke's *Condensation Cube*, Cage's *4'33"* and Rauschenberg's *White Paintings*. *Condensation Cube* and the drawing machines continuously undergo a process, regardless of the presence of a viewer. They can nevertheless be affected by the viewer, and it is only when the viewer plays a part in the work (and the machine reacts to their presence) that it it would seem to be fully realised, activated, or completed. In a similar fashion, *4'33"* and the *White Paintings* can exist independently of a viewer in some sense – the paintings will still hang on the wall, and the silence (or ambient sounds) that Cage frames still occur, but without the presence of the viewer to complete the system, there is a sense in which some aspect of the meaning of the work is lost. The drawing machines can also be put alongside *4'33"* in that they construct networks of impersonal events and relations. We can view Bulloch's drawing machines as a series of short events facilitated by viewers, which are all interconnected by the fact that they form the drawings collectively. In an entirely anonymous manner, each viewer forms a relation to the previous and the next, as well as every other viewer that has interacted with the machine and its drawing. In a similar fashion, each member of the audience of *4'33"* forms a relation with each other, as they simultaneously generate and participate in the event as a collective. Although there is clearly a sense in which Bulloch's drawing machines could be said to connect people, there is another sense in which they are less anthropocentric than those of Graham and Nauman. That is to say, they do not faciliate social interaction on a direct level but create more impersonal networks – considering socio-technical relations in more impersonal terms as connected systems of events.

Many of Eliasson's artworks are focused on the viewer in a similar sense, in that they are not imperatively required, but do play a role in completing the work. With many of his artworks titled in reference to the viewer specifically, containing words such as "your" and "self"[6], ownership or control is seemingly placed into the hands of the viewer, and it would indicate that the work exists entirely for the viewer. This is a view discussed by Frichot (2008, p. 33), who comments that:

> The second-person pronoun of the titles clearly places the ownership of the artwork with the beholder: the art is incomplete without the uncertainty of the one who perceives it.

In an interview with Daniel Burnbaum in 2000, Eliasson (cited in Pressplay: Contemporary artists in conversation, 2005, p. 179) even goes as far to say that "…without the viewer there is, in a way, nothing" further highlighting his focus on the viewer, and essentially claiming that the artwork does not exist without one. This idea that the artwork is in some sense incomplete without the viewer – but that it simultaneously draws attention to the viewer's contingency and processual constitution - has been a recurrent idea throughout this study, and from this we can see further how Eliasson's practice resonates with ideas grown from systems art, and from the lineage of artworks discussed in these

[6] To name a few: *Your imploded view* (2001), *Your only real thing is time* (2001), *Your intuitive sky* (2000), *Your now is my surroundings* (2000), *Your multiple exposure* (1999), *Your windy corner* (1997), *Your sound galaxy* (2012), *Your light movement* (2012), *Your fading other* (2014), *Your trust* (2014), *Your unpredictable sameness* (2014), *Your felt future* (2011), *Your chance encounter* (2009), *Self-loop* (2015), *Seeing yourself seeing* (2001), *Seeing yourself sensing* (2001)

pages. Eliasson describes the inseparable relationship between the beholder and their surroundings as a relationship of "co-production" (2006, p. 65), in other words, the beholder affects the environment and the environment affects the beholder. This presents to us an insight into how Eliasson thinks about relationality and process. This inseparability is demonstrated not only within his exhibited work but in the way that he operates within his studio:

> I try to see my studio as part of the city and of the world outside it. When you enter the studio, you do not step out of Berlin and into the utopian space of an artist's studio. Instead it is an extension of Berlin; it affects Berlin and Berlin affects it.
> (Eliasson, 2014, cited in Alderson, 2015)

In a similar way to which it was previously discussed the processual development of Burnham's writing and ideas, Eliasson appears to operate his studio in a similar way, allowing the studio and what happens within it to be affected by its surroundings both inside and outside of it and vice versa.

These quotations are resonant with Bourriaud and demonstrate Eliasson's clear engagement with relationality, however, there is still this machinic, technological approach within Eliasson's practice which demonstrates his sensitivity to the relationship between a systemic and relational approach. What is perhaps most interesting about Eliasson's seemingly naturalistic artworks that are intended to induce relationality in some way (again, within artworks such as *The weather project*), is that they are very often mediated by technology. In the case of Eliasson's work, what might appear to have occurred organically (a sun-like phenomenon, fog, or a rainbow, for example) has been technologically produced. Whilst Haacke's *Condensation Cube* could be said to simply house a naturalistic process, Eliasson's techo-naturalistic works literally create them – in *The weather project*, Eliasson presented an artificial sun in the Tate's turbine hall; in *Fog assembly*, fog is artificially produced and released from a metal tubing circling an outdoor space; in *Rainbow assembly*, an artificial rainbow is produced by shining spotlights through a mist in the gallery space. Looking all the way back to the discussion on General System Theory and Cybernetics, in many ways these artworks could be viewed as arising out of the intersection of these theories – bringing together the naturalistic and technological. Whilst artists such as Graham and Nauman could be said to employ multiple interdependent components to create an experience for the viewer, Eliasson attempts to create immersive natural systems to artificially achieve similar effects to Haacke's *Condensation Cube*, but in situations that also encompass the viewer.

Demonstrated through discussing the practice of Bulloch and Eliasson, we can see that in some contemporary art (which is sometimes labelled relational art), there is evidence of both a systemic *and* relational approach, pointing towards an embeddedness of systems in contemporary art production. However, it may be that rather than labelling this approach under the term relational art, that it is better represented by Actor-Network Theory, in that it is not entirely focused on human relationality,

nor materiality (technological or otherwise) but on the way in which these elements might exist together in a truly systemic, symbiotic fashion.

We have also gone some way in observing the narrowness of Bourriaud's human-centric view in *Relational Aesthetics*. Indeed, whilst discussing Bulloch's seemingly purely relational works, he appears to neglect her more technologically systemic works such as her drawing machines, excluding them from his text despite their existence at the time he was writing. Bulloch clearly did make purely relational artworks and can in many ways considered a relational artist, but it is also clear that she is not in complete agreeance with Bourriaud's view. That is to say, Bulloch utilises technology in her work in a highly relational fashion, ultimately producing machinic works which would appear to be more in line with a contemporary systemic approach, as opposed to one which is only relational in Bourriaud's socio-cultural sense of the term. Eliasson's frequent use of technology goes some way in demonstrating this further. Engaging in a practice which is associated so closely to the relational sphere whilst using technology and/or somewhat sculptural materials (such as mirrors) to facilitate this relationality, determines this inseparability between physical components and human relationality that Actor-Network Theory suggests.

Reflective Practice: Systems as Artwork, Viewer as Component

Much of the thinking presented within this text has been accompanied by and developed out of a reflective practice exploring the ideas of *System as Artwork* and *Viewer as Component.* It has focused upon developing artistic systems which are responsive to their environment, with an emphasis upon the place of the viewer within the environment. This began with a series of systemic experiments, and has culminated in a work which is due to be exhibited towards the end of January 2017. A reflective blog[7] has also accompanied the project and contains documentation of its development. Likewise, the written aspect of the project has played an important part in supporting and continuously feeding the practical work - resulting in a continuous cycle of writing, making, and reflection throughout.

Reflecting upon the socio-technical practices of Bulloch and Eliasson, we ultimately found Bourriaud's position a little narrow in its anthropocentric vision of relationality, and concluded that Actor-Network Theory may be more in tune with contemporary systems art. In many ways, this realisation was mirrored in transformations that occurred in my own practice over the course of the year. Initially I viewed my practice as something of a hybrid of systems and relational aesthetics, seeing *Relational Aesthetics* as the contemporary heir to Burnham's "Systems Esthetics". At this stage I was interested in human experience and specifically the experience of the viewer. However, it soon

[7] The reflective blog can be found online at http://louiserobsonmabyresearch.tumblr.com/. Documentation and reflection on concepts and ideas which are not discussed in depth in this text can be found here.

became apparent that this was not entirely in tune with the systems approach that was championed by Burnham – indeed it was similarly at odds with the social dimension of *Relational Aesthetics*.

Today, I am more interested in the various ways in which the viewer can be considered a component of a system, alongside other physical, technological and possibly immaterial components. I am likewise interested in tacit modes of interaction – how an audience can play a role in a system, without any overt engagement or control. Identifying Actor-Network Theory in relation to Burnham's "Systems Esthetics" ultimately allowed me to better accommodate my practice in relation to contemporary systems art, recognising the significance of the materiality and physical qualities of the technical systems that I create, alongside the ambiguous position of the viewer. It also enabled me to think about relationality on a wider scale, considering modes of relational influence that are both internal and external to the institutional sphere.

Environmentally Dependent Systems

Having developed out of a body of work which was engaged in processes of capturing and re-presenting the viewer, which made use of video and audio recording in a style not too dissimilar from Graham and Nauman (Figure 12), my current work began to shift – both in terms of medium and emphasis, to favour a more subtle re-presentation of the viewer. In this sense, it has some relationship to Bulloch's drawing machines, but it more formal and less frenetic in its mode of presentation.

Figure 12. Feedback Camera (Robson, 2014)

My current practice considers ways in which data can be captured from the environment which might include a number of audience members and how this can be *transformed* and re-presented in a graphical fashion. In order to do this, various technological components (Arduino, Processing, Kinect, in various combinations) have been utilised in order to explore ways of sensing and capturing environmental in order that significant events can be captured and represented in a primarily in a visual manner.

In “The Aesthetics of Intelligent Systems” (1970, p. 108) Jack Burnham suggested that “…computer systems can sensitize us to information in the environment that would otherwise be ignored…”, and in many ways, this has been the premise of my use of technology within this project. Initially, the practice began with small systemic experiments which did not capture data from the viewer specifically, but from the environment. For example, I set up a light-dependent resistor in order to capture data of light levels – this fed back to a Processing program in order to produce a live, generative drawing representing the light levels in a given space (Figure 13). This simple starting point was dependent solely upon the environment and did not aim specifically to incorporate the viewer, but rather to explore an idea that arose out of consideration of Hans Haacke’s *Condensation Cube* – namely, *something with a dependence upon the environment that contains it*.

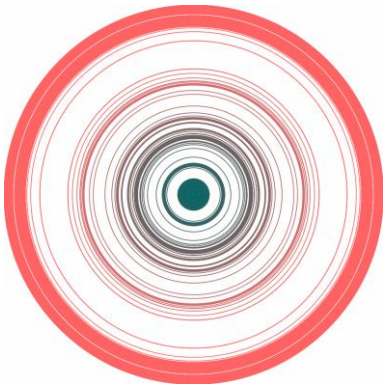

Figure 13. Light-dependent resistor drawing (Robson, 2016)

It could be suggested that I am attempting something of a revival of, or homage to, systems art. Whilst it is true that I am clearly interested in the systems mode of production that Burnham advocated, my aim was to extend the capabilities of systems art in practice in much the same way that Actor-Network Theory could be said to extend the capabilities of systems art in the context of theory. Contemporary technologies such as Arduino, Processing, and Kinect were not available at the time when Burnham wrote “Systems Esthetics”. With this in mind, the aim of my practice was to explore the philosophies surrounding “Systems Esthetics” in the context of the technological culture of today.

Capturing Data from the Viewer

The practice quickly moved from this general environmental focus more explicit concern with the viewer within the environment. However, moving away from the direct figurative representation of the viewer in the space, it began to consider how the audience might be more abstractly represented through the capture of data – considering ways in which the environment and viewer exist together. It is important to emphasise that whilst there is a focus upon the viewer and their role, my work has not been concerned with making directly participatory or interactive art. In most cases such work invites a direct, intentional interaction from the viewer and allows them to make conscious decisions about their experience and the resulting state of the artwork. Some direct viewer participation was briefly

explored to an extent in the early stages of the project, through consideration of an installation that would involve two separate rooms of people that could interact indirectly through triggers of some type. This was however disregarded as the project moved towards an interactive systems concept of a more ambient nature. Rather than directly reciprocal, conversation-type interactions that occur within interactive art, the practice here is based around the creation of open systems which consist of symbiotic, interdependent relationships, and within which changes happen in what could be described as an organic manner, without any consequential decision-making or direct control taking place on the part of the viewer.

This process began by exploring the way in which data from the viewer could be captured, and there have been several avenues of enquiry, including: presence detection (as well as the duration of presence), motion detection, audio capture, and location tracking. These explorations experimented with the representation of the length of time a viewer is present in various visual ways, exploring binary presence through the drawing of black or white lines – something which was carried through to the development of the finalised concept.

Development of the Finalised Concept: Visual Representation

The practice began by asking a simple yes or no question - "*Is there anybody here?*". In assembling a passive-infrared sensor which communicated with a Processing program, I was able to produce a black and white real-time visualisation which successively draws a vertical line every second to represent the present (or lack) of a viewer – if presence is detected, the line is white, if it is not, the line is black. This can be seen below in Figure 14.

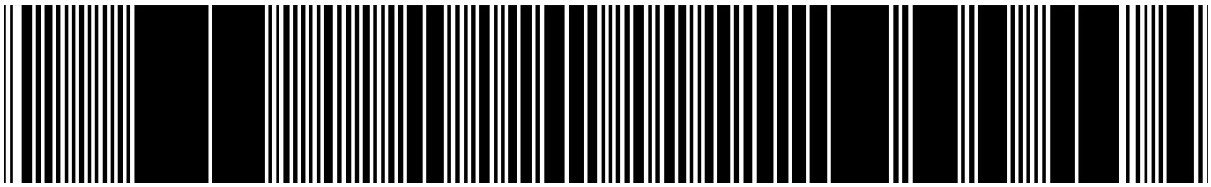

Figure 14. Black and white visualisation (Robson, 2016)

The focus on the presence of a viewer was carried through and developed in a more sophisticated fashion using a Kinect sensor (a motion sensing and people tracking device which produces richer, more specific data about the subjects that it captures – it can not only detect presence, but how the how many people are present, and where they are currently positioned). Moving away from the passive-infrared sensor in favour of the more sophisticated Kinect, enabled further enriched the concept of the work, as well as increasing the accuracy of the data captured. It was now possible to ask more refined questions, such as "*How many people are here?*" and "*Is there anybody moving?*".

Figure 15. Black and white visualisation #2 (Robson, 2016)

Figure 15 represents an audience over time – it demonstrates the varying amounts of people present (each step in the top half of the image represents one person – there are up to four people present in this instance – this can be altered to represent differing numbers of people dependent on audience numbers), and every black line in the lower half represents audience movement. The drawing scrolls continuously across the screen, one vertical line at a time – when it reaches the far right hand side, it begins again from the left.

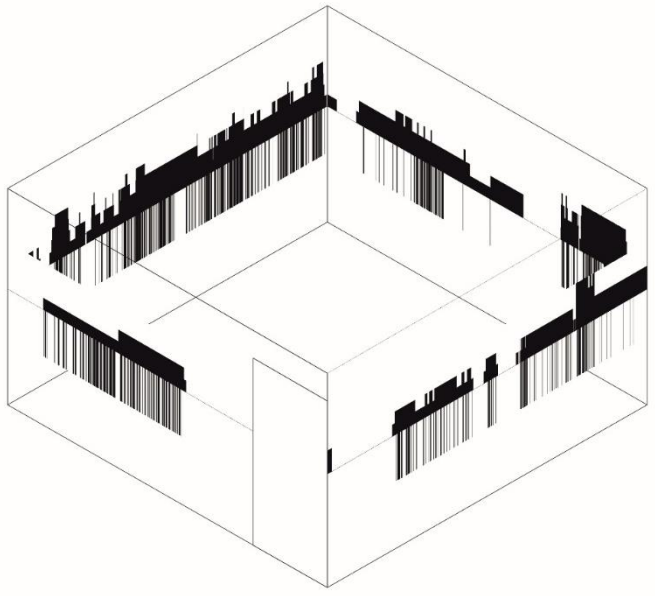

Figure 16. Installation concept drawing (Robson, 2016)

In terms of exhibition, it seemed natural for this to become a part of some kind of projected environment in which the viewer could experience the artwork, whilst simultaneously participating in the creation of its visual form. The visualisation does not represent the viewer photographically, it does however confront the viewer on a large scale – in some ways acting as an abstract mirror – that nevertheless offers a highly reductive, data-centric, binary reflection. This led to several installation concepts being developed – which explored different conceptions of audience movement – one displayed the visualisation on a wall positioned in the centre of a space, another placed it on a central

column of sorts, whilst the final version visualised it as a four-walled, immersive, white cube environment (Figure 16). The four-walled projection concept is the one which has been carried through the rest of the development process. Thus the viewer is confronted with an immersive environment, as opposed to a single viewing pane in which they can witness a trace of their existence – unsettling distinctions between subject and object.

Development of the Finalised Concept: Audio Element

Throughout the development of the visual component, I explored a number of ways in which audio could be integrated into the work, focusing variously upon generated, pre-recorded, and live audio. The early experiments with generated audio and pre-recorded audio ultimately resulted in a sense of detachment from the viewer and the visualisation itself, and as a consequence they were abandoned. To integrate generated audio, I set a tone to play throughout the program, which changed pitch and frequency as the number of viewers increased and decreased, and movement was detected. Although this tone was directly linked to the viewer and therefore the visualisation, the addition of a synthesised sound element (which made use of the same, rather reductive and abstracted information that was being supplied by the Kinect sensor) in some ways cheapened the project, making it feel too crudely technological in nature. Ultimately I wanted to create a *quietly technological* piece of work, with a less obvious interplay between elements. I found that the results were more successful when I juxtaposed richer audio data with the more abstract visual form.

In early tests with pre-recorded sound, I experimented by recording human-centric sounds, such as footsteps, as well as more ambient sounds such as rain, ticking clocks, and the inside of a moving train carriage. These sounds were incorporated into the motion tracking system - muting when motion was detected and played when it was not (in line with the binary character of the black and white visual form). This worked more effectively than the generative sound but it introduced a distance between the viewer and other components of the system, as opposed to integrating them and facilitating the interdependent relationship I was aiming for. It was, however, through this initial experimentation that I realised how important it was that the audio should draw on the live environment of the installation space if the work was to be genuinely symbiotic in character. It was at this point that I started to consider incorporating live audio recording alongside the statistical data capture that was being conducted by the sensors. As a consequence, I began to look back at the audio-centric work that I developed during my undergraduate degree.

This previous audio work consisted of a microphone positioned in an external space (above a doorway in in the corridor leading to a gallery space), and a set of speakers inside a gallery space (on the other side of the doorway). Both were connected to a computer running a Processing program. A description of the work is as follows:

> The microphone records continuously, capturing audio of viewers prior to them entering the gallery space. The program saves audio recordings in ten minute intervals. Every ten minutes, a new ten minute recording is started whilst all of the previous recordings are played simultaneously. For example, if the program had been running for one hour, the speakers would be playing six recordings at once; if it had been running for eight hours, the speakers would be playing forty-eight recordings at once. The audio therefore builds up over time, creating an aural record of the sound in a space. It is played through the speakers at a moderate volume – as the audio builds up, it increases slightly in volume.
> (Robson, 2015)

This richness of the audio recording seemed to complement the more abstract data capture in an interesting fashion, and this led me to combine the two works. In order to integrate this audio element, I altered the timings so that the audio recording matched the length of time it took for the visualisation to complete one cycle of capture – subsequently, it layers with each cycle of the visualisation. I continued to mute the audio when motion is detected – further facilitating audio-visual integration.

Technical Arrangement and Testing

Figure 17. Disused shop space (Robson, 2016)

The final testing stage took place in an open plan disused retail space (as shown from the outside in Figure 17), which had two solid walls and two entirely windowed walls. This did not allow for testing with four projectors, but I was able to test it with three in a corner space, and it did however serve to test the concept and resolve any technical issues. The testing was beneficial for several reasons. It allowed me to lay out all of the components to determine how they would be installed for exhibition, and also to ensure that the system worked as intended. It also allowed me to determine the scale of the artwork, both in terms of the size of the projected images, and the dimensions of the physical space I would require to actually install the work (projector throw is an issue in this, especially when using four projectors simultaneously).

In order to allow the visualisation to run over a maximum of four walls, I had to create a network of five computers – this can be seen below in Figure 18. One central computer is used to capture all of the data from the Kinect (positioned in such a way as to have a view of the entire exhibition space). This central computer has an Arduino connected to it, which sends the Kinect data to four other Arduinos – each attached to one of the other four computers. These four computers then run a separate Processing program which translates the data back into a visualisation, to correspond with the screen number they have been assigned. Each computer is then connected to a projector, and the networked visualisation can run smoothly across four screens.

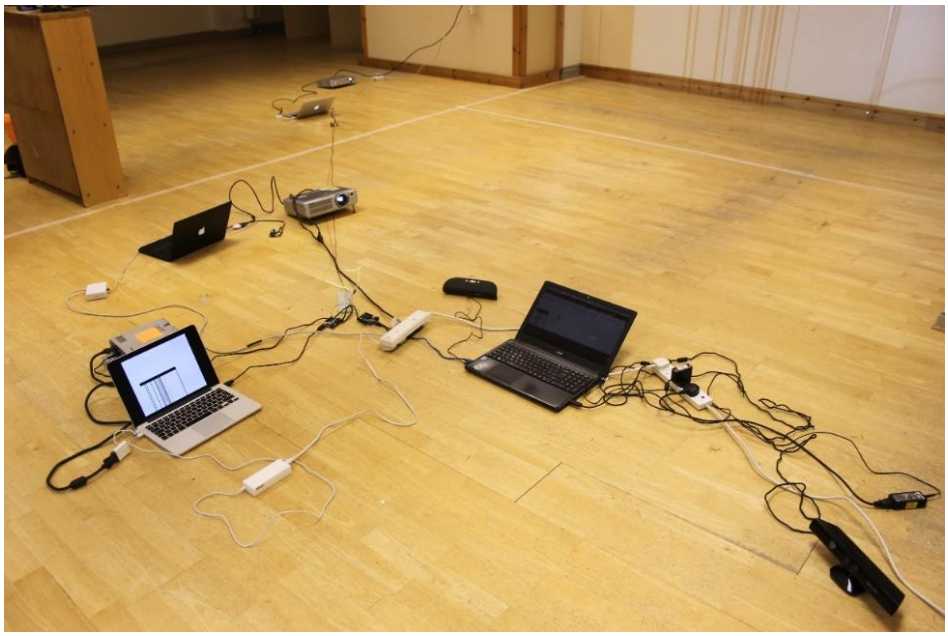

Figure 18. Technical setup of computer, Arduino, and projector network (Robson, 2016)

The technical arrangement for the audio element is slightly simpler, in that it only requires the central computer. A microphone is attached to the computer and installed above the entrance doorway/in the corridor to the space. The Processing program processes and layers the audio, as previously described, and sends it to the speakers. The momentarily muting when motion is detected is achieved with an Arduino controlled relay that is attached to the speakers. When motion is detected, the sound is momentarily muted as the relay halts the signal – when it isn't detected, the sound plays as normal until the relay is triggered.

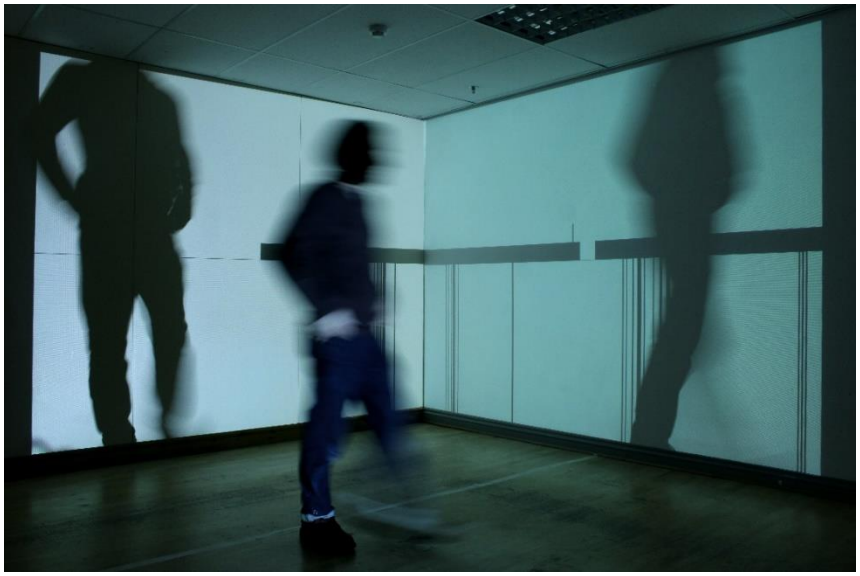

Figure 19. Installation test shot (Robson, 2016)

Figure 19 shows a test shot of two projections functioning together. We can see in the upper half of the projected image that it is representing the one person located within the space, and in the lower half of the projected image movement has been detected at several points.

Exhibition Possibilities

At this moment in time it is not finalised where the work will be exhibited, therefore there is the possibility of it being exhibited in alternative ways. Currently, there are three potential spaces that have agreed to host the work: the disused open plan shop in which I tested the work, half of a shared basement space (a hack space at Huddersfield's Media Centre), and a dedicated, fairly traditional, white cube gallery space.

The three spaces all have their benefits and they present a variety of possibilities for the work. Possibly the most interesting point of discussion here concerns the possibilities presented by the windows of the retail space. The hack space and the traditional gallery space each require a white-cube style of exhibition, however, the window of the retail space subverts the white-cube mode of exhibition in an interesting fashion – but this will also require a slight rethinking of the architecture of the projections. Whilst the gallery and hack space will result in a work that might be positioned as something of a homage to "Systems Esthetics", the retail space opens up possibilities for an expanded, social mode of presentation, that increases the potential for external relational affect.

Contemporary Systems Art?

Looking back at the period when Burnham first introduced his systems approach, it would appear that the time was not yet right for a theory of art focused upon technological systems. Indeed, Burnham's theory was confronted with much critical opposition. The contemporary climate would, however, seem to be more in tune with a systems approach. Technology in particular is met with less suspicion,

and our attitudes towards it would appear to have changed significantly. Computer systems are pervasively embedded in our culture, and we engage with technological systems on a daily basis. It is notable that we are less anxious about the technological mediation of things generally, and there is less scepticism regarding the idea of technological arts. If anything, contemporary technological anxieties are less concerned with the onset of automation, systems and classification, than they are with the consequences of its loss. It is perhaps this cultural shift that underpins the recent resurgence of systems thinking in the context of the arts. Jones (2012, p. 4) comments on this embeddedness of systems within current culture, demonstrating our inescapability from Burnham's approach and systems themselves:

> If Burnham turned from the systems he prophesised, we would find it impossible to do so. We cannot turn from them because they are turning within us…Whether or not we want to see or name them, systems are us.

Jones' comment expressing that "systems are us" serves to demonstrate effectively the prevalence of systems in culture today and leads us once again to consider the question with which we opened this enquiry – "Has a Systems Esthetic Become the Dominant Approach?". It does not seem unreasonable to suggest that Burnham's prophecy has indeed come to pass, with systems becoming embedded not only in the context of art production, but in culture at large – today we operate in a thoroughly systemic fashion. We have seen how this is demonstrated both within the practice of contemporary artists such as Eliasson and Bulloch, but also how concepts of the systemic and the technological have influenced the development of contemporary theory. It has been suggested here that Actor-Network Theory would appear to be the true heir to Burnham's "Systems Esthetics" – and that it is Actor-Network Theory that ultimately suggests an answer to our question. When seen through the socio-technical lens of Latour and Law, the diffuse image of cultural systems that arose out of Burnham's thinking becomes sharpened – revealing the prevalence, influence, application and expansion of systemic thought, and demonstrating its dominance not only in the context of artistic production, but also in the context of society as a whole.

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