

# Participation and Performance: Human-Technology Relations in the Art of Rafael Lozano-Hemmer

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RUPC Working Paper #2

Published June 2015.

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<http://public-cultures.unimelb.edu.au>

*This publication has been peer-reviewed.*

ISBN: 978 0 7340 5146 2



# Participation and Performance: Human-Technology Relations in the Art of Rafael Lozano-Hemmer

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## **Abstract**

*This paper presents a summary of the research and findings of my Masters project: an investigation into the interactive media artworks of Mexican-Canadian artist Rafael Lozano-Hemmer as a means of exploring the human-technology relations that produce and are produced by the works. Situating Lozano-Hemmer's work within a history of participatory art and significant technological shifts, the paper uses two artwork case studies to explore four key concepts from the MA project: embodiment, autopoiesis, techno-social milieux and distributed agency. The project draws on the work of Bruno Latour and N. Katherine Hayles, with reference to the work of other key theorists including Donna Haraway and Gilles Deleuze, to challenge a humanist perspective of technology and argue for a posthumanist framework in which technology comes to be understood as a techno-social performance.*

## **Introduction**

This paper presents a summary of the research and findings of my Masters project. The project is an investigation into human-technology relations within the interactive media artworks of Mexican- Canadian artist, Rafael Lozano-Hemmer. Lozano-Hemmer creates both large outdoor installations and more intimate, gallery-based installations. His works are often complex technological systems that are part of particular socio-historical contexts or, to use his words, 'relationship-specific', and audience participation is a key component of the artworks. Through close reading of selected works, my project explores broader questions pertaining to the nature of technology with the aim of contributing to an understanding of technology as an active process in our world.

My aim in the project, and in this paper, is to use the work of Rafael Lozano-Hemmer as a lens through which to approach the field of technology and technological relations from a non-

anthropocentric perspective. Rather than presenting an idea of technology existing within and for human society, my intention is to consider technology as a process in which humans participate. The human-technology relations in the selected artworks within the project demonstrate different ways in which humans can be shown to be part of, and contributors to, this technological process.

Lozano-Hemmer's artworks exist within and emerge out of the contemporary network cultures of the late 20th and early 21st centuries in which interface experiences are becoming increasingly fluid. The contemporary emphasis on the social uses of technology has produced (and been produced by) technological devices that increasingly structure our social experiences. Lozano-Hemmer's installations re-purpose everyday technologies, which are usually directed towards specific task-based outcomes, to create relationships that potentially allow us to move beyond such an instrumental understanding of technology. In such a movement, we begin to see how technology performs what I argue can be called techno-social agency.

## **Artwork Case Studies**

For the MA project, I selected 5 artworks as case studies through which to investigate various aspects of human-technology relations. The five artworks are *Vectorial Elevation* (1999), *Frequency and Volume* (2003), *Pulse Room* (2006), *Wavefunction* (2007), and *Voz Alta* (2008). These five artworks were selected because they incorporated the following points, which I felt were pertinent to investigating the issues of human-technology relations I wanted to address:

1. Human participation in the works involves physical engagement;
2. The kinds of physical engagement differ between the works, requiring either movement of the whole body, or using particular motions or sounds generated by the body (eg. the pulse or the voice);
3. The works use different interfaces that represent different modes of relating to (or with) technology;
4. The works involve various technologies (such as the Internet or airport surveillance systems) that address wider issues including communal agency and social relations, or surveillance and control;

5. The technologies and interfaces in the artworks demonstrate the particular kinds of human- technology relations that are enacted within early-21st century network societies<sup>1.1</sup>

The key theoretical references for the project are the work of Bruno Latour, N. Katherine Hayles, and Donna Haraway, with reference also to research from areas including: participatory art, philosophy of technology, cybernetics and information theory, actor-network theory, surveillance, systems of control, and distributed agency.

## **Positioning the project**

In the project, Lozano-Hemmer's work is situated within two trajectories: 1) a history of philosophy of technology and social theory, with reference to two major technological shifts that occurred during the 19th and 20th centuries; and 2) a history of participatory art that began well before the emergence of information technologies and the field of media art.

Following is a brief outline of each of these, with concepts introduced here to be discussed further throughout the paper.

### **1) Technological Shifts**

The first of the two technological shifts within which I situate the project occurred around the turn of the 19th century and saw scientific research and development move from an activity undertaken by solo 'inventors' in their home workshops to one conducted within institutions and linked to very specific research goals related to industrial, commercial, and military outcomes. This shift became possible following the Enlightenment, as humans came to see themselves as separate from nature and therefore able to manipulate and control nature for their own purposes. More important for my project, perhaps, is the second shift, which occurred in the mid-20th century, and saw concepts of technology change from being primarily understood as machines that produce physical objects to machines that process data.

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<sup>1</sup> See Castells, Manuel, 2010, *The Rise of The Network Society: The Information Age: Economy, Society and Culture*, John Wiley & Sons Ltd., West Sussex, UK.

The first shift saw theorists such as Lewis Mumford and Martin Heidegger responding to a process of mechanisation through which the role of people within the labour force was radically changing as humans came to be replaced by machines. As these machines increasingly performed the physical tasks previously done by humans, the human body came to be associated with the mechanical functioning of the machines, and technology therefore came to represent the degradation of the human to the mechanical, resulting in what Mumford (1952, p.8) called a loss of a uniquely human 'spirit'. Jacques Ellul (1964), whose work in analysing the societal effects of technology began a little later, similarly saw technology permeating into all areas of society and reducing human activity to tasks geared towards efficiency.

All three of these theorists considered technology to be an active process and all three referred to art in discussing an attempt to find a solution to what they considered the problem (or question) of technology. This approach to how technology was performed within society differs from the approach I wanted to take because these theorists were considering technology from a humanist perspective. Heidegger, however, did also critique this humanist response, arguing that if humans continued to operate within what he recognised as the modern framework (which I'll discuss more), the result would be that technology (as a process) would come to dominate human being.

My approach to understanding technology as a performance that is enacted by both human and non-human participants reflects a shift from this humanist framework to a posthumanist framework. While the notion of the posthuman has been used in different ways and for different purposes, I am using the term as it has been proposed by N. Katherine Hayles (1999) to describe a framework for understanding our human-technology relations. Within this framework, the posthuman also represents the notion of a being that is a historically-specific, contingent agent capable of self-organisation within the organisation of larger systems, and grounded in embodied actuality rather than disembodied information.

This posthuman framework for understanding human-technology relations becomes possible because of theoretical work that responded to the second major technological shift. This shift marks the birth of cybernetics, which laid the groundwork for the emergence of late 20th century developments in information technology. This second shift may be broadly characterised in terms of technology changing from primarily being based on the operations

and processes relating to mechanical objects used to fabricate physical products to being centred around computers and programmable devices used for processing information; and the birth of cybernetics was a key moment within this shift.

The dominant theory of what is referred to as first-wave cybernetics was developed by Norbert Wiener and Claude Shannon, and was a product of the Macy Conferences held from 1946 to 1953. Cybernetics was developed as a theory of the functioning of both machines and the human mind, leading to the development of what became a theory of control and communication. Relevant to my project was how first-wave cybernetics disregarded the role of human interpretation and meaning within message exchanges, and abstracted information from its material context. This moved information systems away from notions of participation so that they did not have to take into account the unpredictable idiosyncrasies of human behaviour. It's also relevant, in relation to the work of Lozano-Hemmer, that this shift, has been located (by Lev Manovich (2001) amongst others) in the development of particular technologies for military use.

The other key theory to emerge as part of cybernetics in relation to my project was the theory of autopoiesis from the work of Humberto Maturana & Francisco Varela. This marked the beginning of what has come to be known as second-wave cybernetics, which occurred approximately 1960-1985. Autopoiesis is a theory of self-creation used to describe living systems that reintroduced the notion of reflexivity into studies of cognition.

Lozano-Hemmer has often deliberately referenced elements within this history of technological change in his artworks by incorporating concepts such as autopoiesis and reflexivity and using various communications and surveillance technologies. He has said that he intentionally creates works through which he seeks to change people's framework for relating to these technologies.

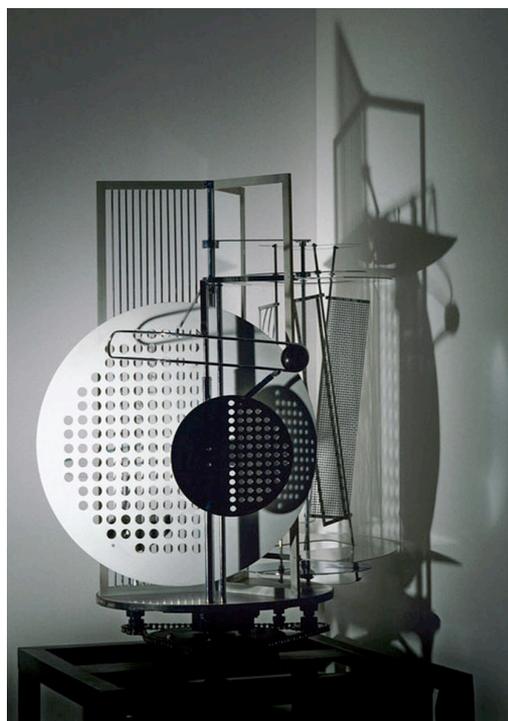
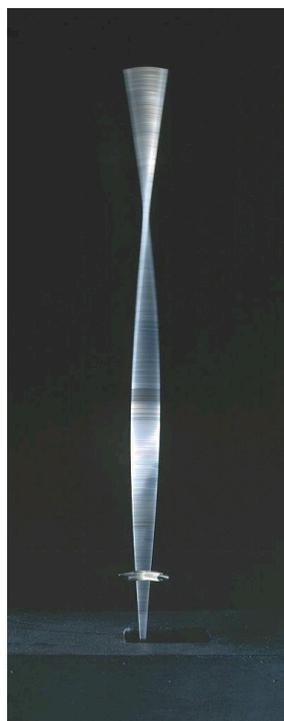
## **2) Participatory Art**

The second trajectory within which the project is positioned is a shift in which art audiences move from being spectators to being participants within the artworks themselves. The contemporary notion of participation in gallery-based art has a history stretching back at least to the beginning of the 20th century. It has, however, sat outside the mainstream for

most of its history and it's only very recently that the possibilities of 'interactivity' have become so prevalent that participation is no longer considered radical or threatening.

Early 20th century kinetic sculpture by artist such as Naum Gabo and László Molohy-Nagy, began to shift away from pictorial and figurative representation by using technologies to draw attention to both the body and art as objects of perception. These abstracted, mechanised sculptures used electronics to overcome static representation in art by introducing elements of time and motion, reflecting the movement of bodies through space.

This shift towards explorations of the experience and perception of motion and time gained momentum during the 1950s and 1960s when the emergence of computing technologies began to influence artists. At this time, artists such as Ben Laposky, Nicolas Schoffer and Alvin Lucier began to take an informational approach to the production of images, sculpture, and composition, using various techniques to produce works that used feedback and patterning. By the mid-1960s early video artists such as Nam Jun Paik also began using feedback in their work.

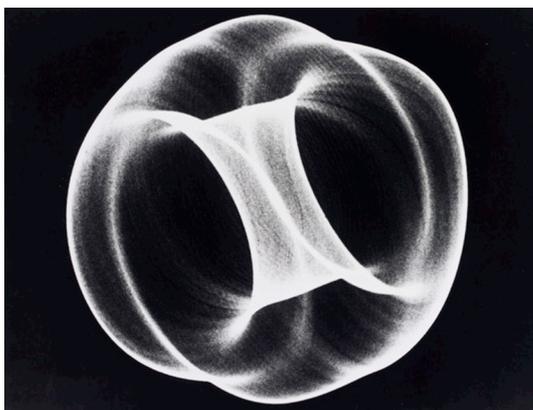


L: Naum Gabo, *Kinetic Construction (Standing Wave)*, 1919-20.

R: László Molohy-Nagy, *Light Space Modulator*, 1923-30.

Three key texts from this period recognised the shift that was taking place: The first is the famous lecture "The Creative Act", given in 1957 by Marcel Duchamp. In the lecture,

Duchamp discussed the role of the spectator in the making of an artwork, giving recognition to the interpretive role of the spectator in this process. The second, published in 1962, is Umberto Eco's "The Open Work", which identified a significant shift that had occurred in the early 20th century when modern artists, writers and composers began creating works that, as he said, "can be defined as 'works in movement,' because they characteristically consist of unplanned or physically incomplete structural units." (Eco, 1962, p.12) Eco clearly described how the spectator became a participant within artworks that deliberately allowed for the audience (or chance) to alter the work's content. Finally, in 1968 Jack Burnham recorded this paradigm shift in his essay "Systems Esthetics," which brought new theoretical attention to the emerging 'systems art' being produced at the time that marked what he called a "transition from an *object-oriented* to a *systems-oriented* culture" in which "change emanates, not from *things*, but from the way *things are done*." (Burnham, 1968, p.31)



L: Ben Laposky, *Oscillon 40*, 1952.

R: Nicolas Schoffer, *Chronos 5*, 1960.

From the 1970s on, artists such as Nam Jun Paik, Woody and Steina Vasulka, Bruce Nauman, and Dan Graham were using video to create feedback systems that reflected cybernetic concerns either by creating works that concentrated solely on electronic signal as the input and output of the artwork or by embedding the viewer inside the artwork and creating feedback loops of their image or voice.

More recently, the works that have been grouped under the umbrella term Relational Aesthetics<sup>2</sup> since the early 1990s by artists including Rirkrit Tiravanija, Jens Haaning, Pierre Huyghe, and Philippe Parreno have brought greater focus to social or relational experiences

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<sup>2</sup> See Bourriaud, Nicolas, 1998, *Relational Aesthetics*, Tr. Simon Pleasance & Fronza Woods with the participation of Mathieu Copeland, Les Presse Du Reel, France.

as art. All of these works and movements have shifted the traditional perspective of participatory art so that audiences have recently come to be seen as much more central to the existence of an artwork.

Claire Bishop (2006) is one theorist who has extensively discussed this history of participatory art, and it has also been traced in exhibitions such as Rudolf Frieling's 1998 *The Art of Participation* at SFMOMA. Both Bishop's text and Frieling's exhibition present this trajectory as part of an art historical narrative in which participation is about human engagement. My intention within my project was to expand this notion of participation to include the non-human components of an artwork, which in the case of Lozano-Hemmer's digital media artworks would include programming code and electricity. This creates a shift in the general terms of the art history argument by viewing these works from an actor-network perspective in which human and non-human networks can be considered to have agency. By applying Latour's notion of networks to these artworks, I consider how these non-human elements can also be seen as significant participants in the processes of the works.



L: Rirkrit Tiravanija, *Untitled (Free)*, 1992.

R: Jens Haaning, *Super Discount*, 1998.

Lozano-Hemmer's practice has been a part of, and taken advantage of, both these shifts (the technological and the cultural), allowing him to create what he calls 'relationship-specific' artworks that incorporate sophisticated technologies into communal experiences. This concept of the relationship-specific work refers to the relationships formed within the work, and the behaviour that emerges between the humans, architecture, and non-humans involved in each specific installation.

## **An Amodern Approach**

The argument in my project is based on the amodern approach introduced by Bruno Latour, which allows us to consider technology from a non-anthropocentric perspective. Latour

(1993, p.13) argued that the theoretical split that had been created between nature and society was a humanist construction that actively ignored the simultaneous production of non-humanity - “objects, or things, or beasts” - and the networks, or relationships, between them. Latour’s (1993, p.11) claim was that this nature/society division (which was a product of modernity) separated (or purified) nature, culture and discourse in order to produce objects and subjects. In place of objects and subjects, the amodern approach sees assemblages, which are networks of humans and non-humans that are able to act in the world. Such assemblages are emergent processes that must be performed continuously because the networks themselves are created through the performance of the connections between the actants.

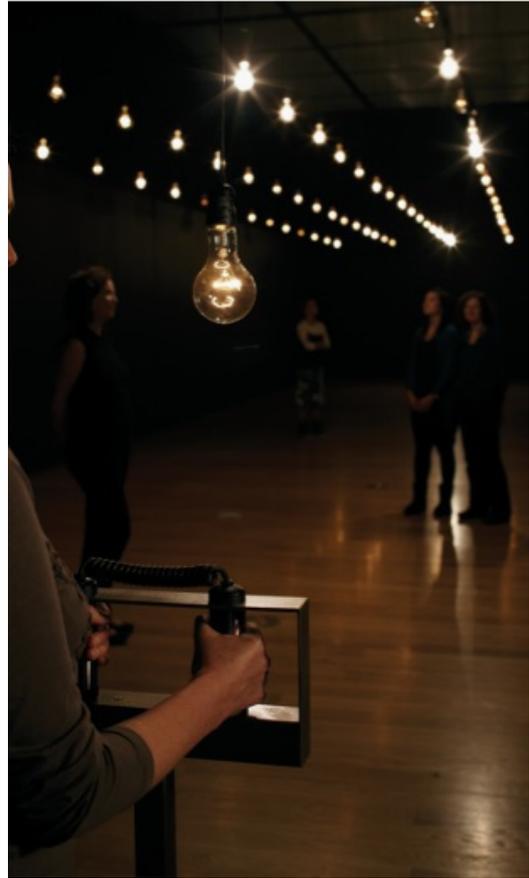
This paper addresses four of the key concepts from the project, and discusses them in relation to two of the case study artworks. The four concepts are: embodiment, autopoiesis, techno-social milieux, and distributed agency. The two artworks that will be discussed are *Pulse Room* and *Wavefunction*.

#### 1) *Pulse Room* (2006)

*Pulse Room* is a gallery installation in which a large room is filled with 100 light globes hanging from the ceiling in an equally spaced grid. On entering the room, the visitor sees a space lit by a hundred pulsing lights. There are two metal sensor bars (similar to those used for gymnasium equipment). As the visitor takes hold of these, their pulse is measured and registered by the artwork and a light hanging directly in front of them begins to flash with the rhythm of their own pulse. There is then a momentary pause in which all the lights in the room go dark, and then the room fills again with the orchestra of flashing lights representing the heartbeats of the most recent 100 people to have participated, with the first light bulb in the grid showing the most recent visitor’s pulse.

Our pulse, even when we are made aware of it, is usually something that we hear and feel, but not something we are accustomed to seeing. To have our pulse appear visually before us creates a complex relationship between the human body and the light bulb that challenges the Enlightenment notion that autonomy is a key characteristic of human being. Instead of this autonomy, *Pulse Room* indicates a more ambiguous role for human being within the technological processes of the artwork and calls for a different understanding of how bodies participate in processes of information exchange.

R: Rafael Lozano-Hemmer, *Pulse Room*, 2006, Manchester Art Gallery, Manchester, United Kingdom, 2010. Photo, Peter Mallet.



## 2) *Wavefunction* (2007)

*Wavefunction* consists of nine rows of white chairs in the centre of a room. The room is set up with a motion detection system that uses surveillance cameras to monitor bodily movement in the space. The system is similar to those used in airports and government buildings that are able to detect differences such as height, weight, and skin colour. It is a highly advanced tracking system that continually monitors exactly who is entering and moving about the room, and the tracking system is on display in an adjacent room. Each of the chairs is fitted to an electro-mechanical piston that allows it to move up and down on a vertical axis, and these pistons are all connected to each other both physically and through the software program, so that the chairs form an array. When a person enters the room, the chairs closest to them rise up. The movement is then 'noticed' by the surrounding chairs, causing them to respond by rising also and creating a flow-on effect that produces a wave of motion throughout the array. The work can respond to multiple 'inputs' producing complicated patterns of interaction in relation to different visitors.

## EMBODIMENT

Katherine Hayles (1999, p.28) has argued that since the development of the information age, we have been moving from a presence/absence paradigm towards a pattern/randomness paradigm - in which pattern and randomness function like complementary moves rather than binary opposites, and meaning arises from the continual interplay between them. She notes that pattern came to be seen as more important than presence when information (which was defined by Claude Shannon as a probability function and therefore as a pattern that was not tied to any particular materiality) became dematerialised during first-wave cybernetics. And yet, as Hayles (1999, p.12) has said, the concept of 'bodiless information' was a way of simplifying the complexity of real world situations and, is part of what she (1999, p. 12) calls the 'Platonic backhand', which supports the notion that complexity is somehow a "fuzzing up" of an essential reality."



Rafael Lozano-Hemmer, Wavefunction, Subsculpture 9, 2007, Mexican Pavilion, 52 Biennale di Venezia, Venice, Italy. Photo: Antimodular Research.

The notion of disembodied information that developed during first-wave cybernetics has been deconstructed at a theoretical level by theorists including Hayles and Latour, who have argued in support of the material conditions essential for the existence of information.

Within the last decade our social relations have become increasingly entangled with the technological environments within which we live; many recent technological developments have seen the implementation of particular technologies in contexts where separating information from its material existence is not the best methodology for understanding the nature of the exchange (eg. many medical or surveillance technologies or tracking technologies such as fingerprint or voice identification, and heart monitoring, etc.). Artworks like *Pulse Room* allow us to experience how human participation within technological processes is frequently a physical engagement that cannot be reduced to a set of immaterial instructions carried solely by software and hardware (as originally proposed by first-wave cybernetics).

*Pulse Room* relies on physical presence for participation, and yet presence is not the primary thing that is registered. The means of participating in the work is the communication of a patterned sequence of information: your pulse. The way in which *Pulse Room* embeds the human pulse within the technological system of the artwork demonstrates the notion of the posthuman as discussed by Hayles. The artwork uses a biometric system to analyse the participant's heart rate – a pattern that is unique for each participant – and then responds to this with a variation in the artwork each time. We are not able to control the beating of our heart in the same way we might feel we have control over our thoughts. We cannot, consciously, speed it up, slow it down, or stop it without physical effort and it is not something we share or communicate with others except through physical touch. The physicality of our pulse as an involuntary muscular process inside our bodies means that it is not so easily reduced to mere information; the information communicated within *Pulse Room* can be seen to be entangled with the particular muscles whose movement creates the pulse.

If we consider the artwork as we would through a traditional art historical approach, we would see it as made of physical objects including light bulbs, electrical cables, computers, biometric sensors, and the building housing the installation. And yet it is the flows of electrical current between and through these objects allow us to experience them as an artwork in the way that it is intended – but only if human beings are also a physical component of the work. Without this human participation, the artwork would be dark and still. It is reasonable to say, as artist Liam Gillick (2000, cited in Bishop, 2004, p.61) has said of

his own participatory artworks, that “without people, it’s not art – it’s something else – stuff in a room.”

This suggests we need to consider the artwork not as a collection of passive objects, but as a collective of actants (to use the ANT term) – both human and non-human. If we recognise the artwork as an assemblage or collective in which we are implicated, we acknowledge both the human and non-human actants and the complex relationships between them. With this recognition we can begin to see how *technology* within the artwork can be understood not simply a set of tools that make the artwork operate, but as an emergent process enacted by this collective. Human participation in *Pulse Room*, particularly the way that people participate – by physically grasping the sensors – demonstrates that we cannot distance ourselves from the actions of what we consider to be technology. Our bodies (our heartbeat felt through our palms) are connected through this action to all the other components of the collective in this technological process. This use of the human heartbeat in *Pulse Room* helps us to see how entangled we are – both physically and emotionally – in any exchange that involves our bodily information.

In *Pulse Room* our bodies and our identities (as participants) are defined by pattern forming and pattern recognition. It is a pattern that is registered when a visitor grips the sensors – a unique pattern that identifies that person individually and entangles them in the artwork itself. This meshing of individual and collective patterns reflects the complex nature of social relations within network societies: the work allows for singularity in that each individual pulse is maintained as a distinct element, and entangles this singularity within a field of pulses that constitutes the collective.

Our heartbeats, therefore, represent our individuality as defined through the unique pattern of our pulse; if we consider the relationships that are formed as part of the artwork (between each participant, and between the participants and the machines, light, electricity, etc.) to contribute to the patterns that constitute our ‘self’, we gain quite a different understanding of identity, and of our involvement within the technological processes of the work. In this way, *Pulse Room* demonstrates the notion of the posthuman as it is understood by Hayles; and shows that, insofar as we are creating ourselves through these technological processes, we are already posthuman.

## AUTOPOIESIS

The concept of autopoiesis is useful as a means of showing how we participate in the emergence and behaviour of the environments that we inhabit. Maturana and Varela (1980) first proposed the theory of autopoiesis in 1972 as a theory of self-creation in living systems. The term describes a system as self-generating: the components generated by the system provide the environment that allows in turn for the generation of those components. In an autopoietic system the observer is structurally coupled with the system in such a way that the behaviour of any particular system cannot be taken to be isolated from the actions of the observer, or vice versa. The observer, therefore, is a participant in the realisation of the system itself, being affected by and affecting it in ways that are not always intended or predictable. For Maturana and Varela an autopoietic system is not goal-oriented, and any meaning or causality ascribed to the actions of the system are interpretations added by an observer, produced by their own perspective and circumstances.

In autopoietic theory, systems are operationally closed: it's the organisational closure of the system that identifies it as an individual (a unity that is recognisably distinct from another). Hayles (1999, p.84) has noted that the notion of an autonomous individual in this sense, that became the dominant mode of subjectivity in Western civilization since the Renaissance, has become increasingly difficult to maintain because the cybernetic shift towards understanding "control, communication, and information as an integrated system" radically changed the boundaries between human and machine so that systems (including human systems) were no longer closed but had boundaries that were continually shifting and being redrawn. Varela's theory of enactivism, which he went on to develop following his work with Maturana, embraced this more open approach to identification of living systems (Varela, F. J., Thompson, E., and Rosch, E., 1991). As such, enactivism is a theory of embodied cognition that reflects the notion of contextual or situated knowledge that was being introduced by cultural theorists (such as Latour and Haraway) at the time. In an enactive system, the individual is not closed, but changes and continues to emerge through its embodied interactions with the world.

My project considers these concepts in relation to *Wavefunction*, an artwork that can be understood as an environment that consists of different components including the chairs, the camera, the tracking software, the computer, and the human participants. There is a limit

to the possible movements of the chairs resulting from each of them being a component of a whole system. The chairs are constrained by the particular parameters that have been established by the artist and written into the artwork by the computer programmer (as well as the functional limitations of the piston mechanisms that enable the physical movement). When a person enters the room, they become a part of the environment that is the artwork, together with all the other elements in that environment. Some of these other elements of the artwork 'see' the person arrive and react accordingly. But it's not a one-way interaction: depending on your movements, you can also play with the chairs. Your behaviour affects the behaviour of the chairs, and this interaction with the chairs affects your behaviour also.

In a sense, we can consider *Wavefunction* as a closed system in the way that an autopoietic system is operationally closed: it has boundaries that define the time and place of the behaviour of the system, and parameters (even if quite broad) of the kinds of behaviour that can occur, and those behaviours ensure the continuance of the artwork itself. Yet, any particular installation of the artwork is simultaneously open to interactions with the wider environment (social, cultural, political), all of which affect the artwork and make each installation specific. The artwork develops in relation to the wider environment within which it is installed, while it maintains a certain structural integrity that makes two separate installations recognisable as instances of the same artwork. This push and pull between the simultaneously open and closed nature of the artwork creates a tension in which meaning is contingent upon the many components contributing to a particular installation of an artwork. This tension further supports the argument put forward by Umberto Eco (1962) that the cybernetic goal of a clearly delivered message is not necessarily the highest order of communication. By foregrounding contingent and situated meaning, *Wavefunction* promotes the ambiguity inherent within any such communicative attempt and highlights that communication is a complex process that does not end when a seemingly discrete message has been 'received', but remains open, continuing to create meaning through the ongoing behaviours and relations of the actants within their wider environment. In *Wavefunction* meaning emerges through the diverse behaviours that take place between the elements within the 'closed' artwork and through the 'open' relationships of those elements (which includes the participants) with their surrounding environment.

## TECHNO-SOCIAL MILIEUX

Gilbert Simondon's (1964) notion of a milieu is useful within this discussion as a means of arguing that visitor participation in these systems is part of their mode of being in the world. That, through their actions, the participants come to belong to an environment that can be understood as what I call a techno-social milieu. Based on Simondon's (1964, p.300) argument that the emergence of the individual and its milieu is an ongoing process of individuation, I argue in the project that participation in an artwork like *Wavefunction* demonstrates our participation in technological systems more generally and that we cannot step outside of the milieux in which we live; which is to say that we would not be who we are without the techno-social milieux within which we participate, and the techno-social milieux would not be what they are without our participation.

The dynamic nature of the interactions between participants and chairs in *Wavefunction* show that our participation within the environment of an artwork such as *Wavefunction* is complex; that the behaviour taking place within the environment, including our own behaviour, is not completely controlled or instigated by us. Such dynamic interaction demonstrates that, while we may consider that we should have control over the objects that are products of human enterprise, this attitude does not take into account the ways in which those objects behave as collaborators in shaping and enacting our own agency in the techno-social milieux we inhabit. *Wavefunction* demonstrates what Anthony Giddens (1993) has called the 'duality of structure'; it shows that we do not have what Giddens called a 'free essence' that is separate from our participation in the milieu of the artwork, but nor does it ignore our capacity to produce effects and differences.

In this sense, because the relations performed between the participants, the chairs, the camera, the computer and the software, etc. create the artwork, by applying the concept of assemblage borrowed from ANT, we can say that an artwork such as *Wavefunction* has its own agency - an agency that extends beyond the individual agency of each element. This is not to say that individuals do not have localised agency, nor that there is a lack of power in that localised agency to effect change, but it is recognition that humans are not the only entities acting within the system.

## DISTRIBUTED AGENCY

We are now living in what Deleuze (1992) has called 'societies of control' where we act as what Deleuze calls 'dividuals': identified through passwords and the information patterns created by our digital actions. This is a shift from the disciplinary societies that produce individuals and represents what Scott Lash has called a shift from hegemonic to post-hegemonic power. As dividuals we act in tandem with the non-human actants that also participate in our social relations - that is, the non-humans who participate in the becoming of our dividual identities and are, therefore, inseparable from those identities and from our actions. This requires acknowledging that we, as posthumans living within techno-social milieux, do not ever have complete control over technology, but also that our social relations are not entirely controlled or determined by technology.

As Hayles (1999, p.288) has said, "In the posthuman view... conscious agency has never been 'in control'. In fact, the very illusion of control bespeaks a fundamental ignorance about the nature of the emergent processes through which consciousness, the organism, and the environment are constituted." The actions of each actant affect all others, creating an unstable environment with complex dynamics of influence and interaction - we have agency, but technology has agency too. Hayles (2006, p.164) has called this interaction the co-evolutionary spiral, which also includes "Cultural beliefs and practices ... because they influence what tools are made and how those tools are used, which in turn affects who we are as biological organisms, which then feeds back into the co-evolutionary spiral."

Within hegemonic power relations, technology is understood instrumentally and power is seen to be exercised through technological tools. But, as Heidegger (1954b, p.32) said, "So long as we represent technology as an instrument, we remain held fast in the will to master it." And not only to master technology but, through technology, to master all nature: In Heidegger's view: "The modern technologist is regularly expected, and expects himself, to be able to impose order on all data, to 'process' every sort of entity, nonhuman and human alike, and to devise solutions for every kind of problem. He is forever getting things under control." (Lovitt, 1977, p.xxvii) Such hegemonic expressions of power understand that those who hold the technology are therefore perceived to control the technology. While questions of access and ownership are still important, the shift to networked digital technologies changes the nature of both power and agency within human-technology relations so that

issues of control become increasingly complex. It becomes difficult to maintain a purely instrumental understanding of technology in this post-hegemonic environment because the technologies themselves cannot be seen to be neutral in these human-technology relationships but are participants that also wield influence.

When we look at these human-technology relations from an actor-network perspective, control becomes contextual and contingent as it is localised within the specific actions, influences and relationships of the various actants, including the technological tools themselves. The post-hegemonic power dynamics exerted through contemporary human-technology relations emerge from the mutual influence of each actant on all others. This is not to say that certain technological tools only allow us to perform particular acts, but that they shape our environment and thereby encourage us to behave in certain ways - ways which are not necessarily foreseen or anticipated when the tools are developed.

In *Wavefunction* Lozano-Hemmer chose to use sophisticated surveillance technology in order to draw attention to the power, ubiquity and non-neutrality of such equipment in social surveillance systems. In an airport where monitoring systems similar to that in *Wavefunction* are used to track who is arriving in or leaving a country based on indicators such as facial recognition that can be programmed to provide 'profiles' that align with racial stereotypes, the system includes the human designers and operators of the software. Such systems function through the interaction between social and technical protocols, combining social prejudice with a technical facility for differentiation. Such differentiation is a necessary component of surveillance, because "without discrimination between those who belong and those who don't surveillance loses any practical function." (McQuire, 2008, p.143)

While bodies within such systems become the things that identify people (rather than passports or other documents), the complex network of information exchange within these environments and how it is used to track and categorise individuals, is typical of how bodies come to be identified through code and how power is exercised in Deleuze's societies of control. With a huge amount of data being generated within the system every minute, simplification through categorisation - or profiling - is how the system is able to make use of so much data and how people come to be identified as belonging, reductively, to a particular subset of the airport population. This process of identification and categorisation is then used to track mobility through the airport and increase efficiency, purportedly for the benefit of

passengers, so that the system knows where they are and how they are behaving (Adey, 2004, p.1373). Because of the complexity of surveillance within an airport, many of the functions of such a system have become automated, and decisions made within the system (by which I mean the human and non-human network) become 'naturalised' within that environment so that the entire system, rather than any individual, comes to be seen as responsible for those decisions. While airports have been a key site for the development of such technologies, these technologies are no longer used only within that context but have become widely deployed within urban spaces to create what David Lyon (2001) has called the 'surveillance society.'

By incorporating such a system within an art installation, Lozano-Hemmer places it within a cultural context in which the rules of engagement are very different from those of a major airport terminal. *Wavefunction* doesn't only bring our attention to the complex network of actants who contribute to the functioning of the overall system, it is also a physical performance of the dynamic interplay that is the co-evolution of our techno-social environment. It highlights what Frank W. Geels (2004, p.908) has referred to as a 'game', and such games necessarily involve power-play: "Actors interact (struggle, form alliances, exercise power, negotiate, and cooperate) within the constraints and opportunities of existing structures, at the same time that they act upon and restructure these systems." (Geels, 2004, p. 907)

*Wavefunction* demonstrates the push and pull of these 'games', not only through the behavior it encourages, but also by revealing the usually hidden elements of the system. *Wavefunction* in particular draws attention to the actions of the non-humans within this collaborative process by tipping the balance between humans and non-humans further towards the non-humans: it is the non-humans who perform while the humans seem curiously passive. The interface of the installation is the eye of the camera tracking people's movements within the room. While it might be clear that your movement is affecting the movements of the chairs when there is one person in the room, there remains a question, especially when several people are in the space at the same time, as to whether the chairs might be acting on their own. By subverting this balance and giving the behaviour of the non-human actants physical form, the installation makes us more aware that we are continually engaging with technologies that are acting in ways that we are not necessarily aware of and perhaps don't understand. This helps to shift our understanding of agency within these human/non-human networks.

The movement that takes place in *Wavefunction* is an exchange, a give and take between the various participants in the installation, and it is through these movements that participants become physically involved in the kind of data flows that constitute our societies (of control). If we read this exchange as a physical enactment of the digital navigational practices in which we are constantly engaged, the movement becomes a performance of Latour's (1993) 'middle kingdom', or what Hayles (1999, p.199) has called 'incorporating practices'. Latour (2010, p. 11) has argued that such navigational practices indicate that the individual and society, as the two poles of social theory, have lost relevance. Latour is not arguing that power relations dissipate within this new mode, but that the centre stage is no longer occupied by the individual or society, or the exchanges between them, but by the navigational practices themselves and the complex, distributed agency that performs them. For Hayles (1999, p. 199), an incorporating practice is "an action that is encoded into bodily memory by repeated performances until it becomes habitual." As with Latour's navigational practices, these incorporating practices become a means of identification that does not rely upon traditional notions of the individual, but is more relevant for the kinds of human-technology relations performed in contemporary network societies.

An artwork like *Wavefunction* shows that we are deeply embedded in our technological processes and that, together with the technological tools, we jointly generate these processes. It is this generative process - the performance of our navigational practices - that I am arguing is technology. It is a continual process of incorporating practices that contributes to the emergence of our techno-social milieu, and might better be called techno-social agency. Perceiving technology in this way acknowledges that there is a dynamic relationship between the individual agency of each participant and the techno-social agency that generates our techno-social milieu, and that each time we act, we are participating in the performance of this techno-social agency. Artworks such as *Wavefunction* have the potential to make us aware of this performance by drawing attention to the movement of our bodies within the technological system that forms the installation, allowing us to experience how our individual actions influence, and are influenced by, the overall environment.

## CONCLUSION

My project traces a trajectory of social-theoretical-cultural shifts that have enabled a re-imagining of contemporary human-technology relations. By tracing this trajectory through

art, science and social theory I aim to show how the current moment (as one in a historical pattern of such moments) provides us with both experiences and conceptual tools that encourage us to see contemporary human-technology relations as collaborative processes that emerge from embodied practices. At moments of significant cultural and technological change, art has often been at the forefront of signalling a need to find new ways of understanding human-technology relations. The participatory artworks of Rafael Lozano-Hemmer incorporate digital, networked technologies in ways that challenge the humanist notions of technology that prevailed during the age of machine technologies, and encourage a posthuman perspective in which technology comes to be understood as a performance of techno-social agency.

The notion of a technological agency is not new, but more often than not it has been considered as either a threatening or enhancing force in relation to humanity. The techno-social framework proposed within my project challenges both techno-pessimistic and techno-fetishistic arguments, both of which place uncontrolled power in technology at the expense of human agency and contribute to a techno-deterministic perspective of social relations. I argue that the humanist perspective of theorists including Lewis Mumford and Jacques Ellul can no longer explain the complex, distributed human/non-human networks within which we live. By demonstrating the essential materiality of our technological practices and tracing the dissolution of the liberal humanist subject, I argue that the posthuman is a more useful figure through which to understand contemporary human-technology relations. The figure of the posthuman allows us to perceive that techno-social agency does not threaten our humanity because the posthuman - we posthumans - collaborate with the non-humans in our techno-social milieux to perform that agency as part of our being. Viewed from this posthuman perspective, techno-social agency does not erode or enhance our humanity but is enabled by and enables it. By adopting the amodern approach proposed by Latour, it becomes possible to examine Lozano-Hemmer's artworks from this non-anthropocentric perspective within which power is distributed amongst all actants within a particular network. From this non-anthropocentric perspective it becomes possible to consider how collective action between humans and non-humans produces the environments within which we live.

Throughout the project I argue that art takes us out of our expected interactions with technology and allows us to perceive our relations with technology in new ways. In this context, art is a catalyst that encourages us to re-imagine what technology is within our lives

more broadly. The interfaces encountered in the case study artworks promote specific forms of participation that push us to divest ourselves of the anthropocentric perspective that has dominated our thinking about human-technology relationships until very recently. If such artwork installations make it possible for us to experience a posthuman framework for understanding contemporary human-technology relations with greater emotional and intellectual insight (if art can, indeed, express what Heidegger (1954b, p.28) called the 'saving power') it's because these artworks take us out of our expected relations with technology and highlight our actions as part of a techno-social performance in ways that make it possible to observe and experience the ambiguity and complexity of human-technology relations. When our own actions, in collaboration with the actions of other, non-human actants, are involved in producing the techno-social milieu that enables that experience, we need to consider technology not as a group of objects/devices (tools) that we use, but as something that we do - and that we do collectively.

## BIBLIOGRAPHY

- Adey, Peter, 2004, Surveillance at the airport: surveilling mobility/mobilising surveillance, *Environment and Planning A*, Vol. 36, pp. 1365 - 1380.
- Bishop, Claire, 2004, Antagonism and Relational Aesthetics, *October*, Vol. 110, Fall, pp.51-79.
- Bishop, Claire, 2006, *Participation*, Whitechapel London and MIT Press, Cambridge, MA.
- Burnham, Jack, 1968, Systems Esthetics, *Artforum*, Vol. 7(1), September, pp.30-35.
- Deleuze, Gilles, 1992, Postscript on the Societies of Control, *October*, Vol. 59 (Winter), pp. 3-7.
- Duchamp, Marcel, 1957, The Creative Act, in Lebel, Robert, 1959, *Marcel Duchamp*, Paragraphic Books, New York, pp. 77/78.
- Eco, Umberto, 1962, *The Open Work*, Tr. Cancogni, Anna, 1989, Harvard University Press, Cambridge, MA.
- Ellul, Jacques, 1964, *The Technological Society*, Tr. John Wilkinson, Vintage Books, New York.
- Frieling, Rudolf (ed.), 2008, *The Art of Participation: 1950 to Now*, San Francisco Museum of Modern Art, Thames & Hudson, New York.
- Geels, Frank W., 2004, From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory, *Research Policy* 33, pp.897-920, [online], available from: <<http://www.sciencedirect.com/science/article/pii/S0048733304000496>>, [accessed 24 January, 2014].
- Giddens, Anthony, 1993, *New Rules of Sociological Method: A Positive Critique of Interpretative Sociologies*, Polity Press, Cambridge, UK and Malden, MA.

- Hayles, N. Katherine, 1999, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, University of Chicago Press, Chicago and London.
- Hayles, N. Katherine, 2006, Unfinished Work: From Cyborg to Cognisphere, *Theory, Culture & Society*, v.23(7-8), pp. 159-166.
- Heidegger, Martin, 1954, The Question Concerning Technology, in Heidegger, 1977, *The Question Concerning Technology and Other Essays*, Tr. William Levitt, Harper & Row, New York, pp. 3-35.
- Latour, Bruno, 1993, *We Have Never Been Modern*, Tr. Porter, Catherine, Harvard University Press Cambridge, MA.
- Latour, Bruno, 2010, Networks, Societies, Spheres: Reflections of an Actor-network Theorist, Keynote speech for the International Seminar on Network Theory: Network Multidimensionality in The Digital Age, Annenberg School for Communication and Journalism, Los Angeles, 19 February 2010, [online] available from: <http://www.bruno-latour.fr/sites/default/files/121-CASTELLS-GB.pdf>, [accessed 19 Oct 2013].
- Lovitt, William, 1977, Introduction, in Heidegger, Martin, *The Question Concerning Technology and Other Essays*, Harper & Row, New York, pp. xiii-xxxix.
- Lyon, David, 2001, *Surveillance Society; Monitoring Everyday Life*, Open University, Philadelphia.
- Manovich, Lev, 2001, *The Language of New Media*, MIT Press, Cambridge, MA and London, England.
- Maturana, Humberto and Varela, Francisco, 1980, *Autopoiesis and Cognition: The Realization of the Living*, D. Reidel Publishing Company, Holland.
- McQuire, Scott, 2008, *The Media City: Media, Architecture and Urban Space*, SAGE Publications, London, Thousand Oaks, New Delhi and Singapore.
- Mumford, Lewis, 1952, *Art and Technics*, Columbia University Press, New York.
- Simondon, Gilbert, 1964, *The Genesis of the Individual*, Tr. Mark Cohen and Sanford Kwinter, 1992, in Crary, Jonathan and Kwinter, Sanford (eds.), *Incorporations*, Zone Books, New York, pp. 296-319.
- Varela, F. J., Thompson, E., and Rosch, E., 1991, *The Embodied Mind: Cognitive Science and Human Experience*, MIT Press, Cambridge, MA and London, England.