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## ARTICLE

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# Polysemous light: light as a contradictory material in Rafael Lozano-Hemmer's work\*

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**Abstract**

This paper is a media archaeological study focused on one of the materials that has been recurrent in Rafael Lozano-Hemmer's installations and that has a contradictory character: light. The first part of this essay traces the historical theories about light that have fascinated the artist and shows how these theories are present in some of his works. The second part analyses the use of light as a material that helps to increase visibility and serves for care but also for control purposes. Light in Lozano-Hemmer's work has an oxymoronic character that this paper unfolds, demonstrating its multiple contradictions and the fascination of this artist with its polysemous nature.

**Keywords**

light, installation, surveillance, media art histories

\* This article deepens on the previous research: Claudia Arozqueta. 2013. "Seeing the Unseen: Rafael Lozano-Hemmer's Pulse Works," MA diss., Donau Universität Krems, Austria, 2013. Thesis selected for the Leonardo Abstract Service (LABS).

## *Luz polisémica: la luz como material contradictorio en la obra de Rafael Lozano-Hemmer*

### **Resumen**

*Este artículo es un estudio de arqueología de medios centrado en uno de los elementos recurrentes de las instalaciones de Rafael Lozano-Hemmer y que posee un carácter contradictorio: la luz. La primera parte de este ensayo repasa las teorías históricas sobre la luz que han fascinado al artista y muestra cómo algunas de esas teorías están presentes en varios de sus trabajos. En la segunda parte se analiza el uso de la luz como elemento que contribuye a aumentar la visibilidad y que se utiliza con fines de protección, pero también de control. En las obras de Lozano-Hemmer, la luz adquiere un carácter paradójico, que este artículo desvela demostrando las múltiples contradicciones de este elemento y la fascinación del artista con su naturaleza polisémica.*

### **Palabras clave**

*luz, instalación, vigilancia, historias del arte mediático*

Throughout his career, spanning more than two decades, the Mexican-Canadian artist Rafael Lozano-Hemmer has deployed searchlights, light bulbs, projections and other varieties of lighting in his work, using them in various forms, connotations and contexts. And although his works can be conceived as high-tec gadgetry, they are connected to long traditions of art and scientific experimentation that explore ways of expanding the body beyond its limits through technology. Throughout this essay I consider that light in the works of Rafael Lozano-Hemmer can be read as a paradoxical material that joins the biological with the technological. It oscillates between being a particle and a wave, representing absence and presence, life and reason, an element that has been used with both artistic and surveillance purposes as a tool of freedom, care and control. In many of the works of Lozano-Hemmer, light is a reflection of our binary existence, but mostly it is as an intangible element that permits the visual illusion of the extension of our senses and the energy of our body to unimagined spaces.

### **The physical nature of light**

Light is generally regarded as a physical agent that makes the sense of sight possible; sight being one of the principal forms of human cognition and means of connection to our environment. This condition has made light a captivating and enigmatic phenomenon for all of humanity. Therefore, many studies, both philosophical and scientific, have been undertaken around light and vision throughout history

revealing light as a contradictory element. The scientific and historical interpretations of light have always fascinated Rafael Lozano-Hemmer, particularly the ‘instability’ or ‘bipolar’ character of light: “It is true that most of my inspiration comes from science”. He adds, “I read about everything from wave theory to entanglement. Working with light, for instance, just the fact that there is this duality of it being a particle or a wave, I love that. I love that kind of schizophrenia”.<sup>1</sup>

These theories can be tracked back to the fifth century B.C. when the Greek philosopher Empedocles developed one of the oldest theories of light. He conceived that light travelled with a finite velocity, that vision was the result of rays emitted by the eyes and seeing was the result of their encounter with objects. Many other scholars, including Euclid and Ptolemy, followed this idea. It was several centuries later, when the Persian scientist Alhacen or Ibn al-Haytham rejected this theory in his *Book of Optics* (ca. 1027), arguing that if humans had rays in their eyes it would be possible to look at the sun directly and we would have the ability to see at night (DiLaura 2006, 24). With his observations he discovered that eyes were only receptors and not transmitters of light and for the first time light was conceived as the most important agent of vision.

It wasn't until the mid-seventeenth and the eighteenth century, during the European Enlightenment, that light acquired new interpretations. René Descartes with his rational and mechanistic natural philosophy demonstrated a variety of optical and light phenomena. His treatises explained reflection and refraction, claiming that objects, in opposition to emanation theories, were the ones that emitted light. Descartes claimed that colour and light were a function of

1. Rafael Lozano-Hemmer has expressed his fascination with light in many interviews, particularly with what he calls its ‘schizophrenic’ condition. An interview where he comments on this can be found on ‘Vimeo’ [Accessed: 17 January 2018]. <http://vimeo.com/52664862>.

the eye apparatus, “in particular the fiber of the optic nerve stimulated by the rotational velocities of light corpuscles” (Jay 1993, 77). A few years later Newton expanded Descartes’ ideas with his corpuscular theory of light. “Are not Rays of Light very small Bodies emitted from shining substances?” was a question that Isaac Newton tried to answer in different experiments. This led him to the theory that light was corpuscular and composed by particles, which were refracted by accelerating into a denser medium rather than a rarer medium (Sabra 1981, 13). Newton’s view was accepted for more than a century, even though it wasn’t able to explain optical phenomena like diffraction, which occurs when a wave encounters an obstacle and bends, such as the slight bending of light as it passes around the edge of an object or the apparent bending of a stick when it is immersed in water.

In the early nineteenth century, physicists like the English Thomas Young and the French Augustin Fresnel tried to resolve the question of diffraction by recovering the theory of the Dutch physicist and mathematician Christiaan Huygens (1678), who claimed that light consisted of waves transmitted through a medium called ether. Young managed to explain with his experiments that light behaves like waves, such as sound waves that could interfere with each other. Fresnel brought deeper insight to the wave theory of light by explaining with mathematical methods that polarisation could only be explained if light was transverse and behaved as waves (Breslin 2013). This theory opened up new possibilities for the origin of light, but didn’t present convincing arguments to explain transmission. It was the English scientist Michael Faraday and the Scottish physicist James Clerk Maxwell who explained transmission. In 1831, Faraday discovered that light travelled along the magnetic field. Following this idea, in the publication *A Dynamical Theory of the Electromagnetic Field* (1865) Maxwell postulated that there were electric and magnetic fields that propagate together in what would be an electromagnetic disturbance. The speed with which this perturbation would transmit was very similar to the speed of light, which had been measured at the time. The conclusion was that light was nothing more than an electromagnetic wave.<sup>2</sup>

Many other characteristics of light, like the photoelectric effect,<sup>3</sup> were discovered during the twentieth century. Drawing on the 1900 postulation of the German physicist Max Planck who conceived that electromagnetic energy was emitted in a quantised form, Albert Einstein proposed in 1905 that the photoelectric effect could be explained if light consisted of tiny particles he called *photons*. The energy of a photon would depend inversely on the wavelength of light, according to Planck’s empirical relationships used to explain

black body radiation.<sup>4</sup> It was the discovery of photons that led modern physics to conciliate theories and consider light as both a wave and a particle (DiLaura 2006, 85). The wave-particle discovery and the later quantum physics, as the historian Sean Cubitt has pointed out, fostered the development of technologies dependent on light as a measurable and manageable abstract material (Cubitt 2015, 56).

For more than two decades Lozano-Hemmer has been experimenting with the schizophrenic nature of light, using it as an oxymoronic, polysemic and malleable material: as a sculptor of space, as a metaphor of life and reason, and a system of vigilance used for care but also control. I consider that *Pulse Tank* (2008) is one of the works that better summarises these connotations, particularly

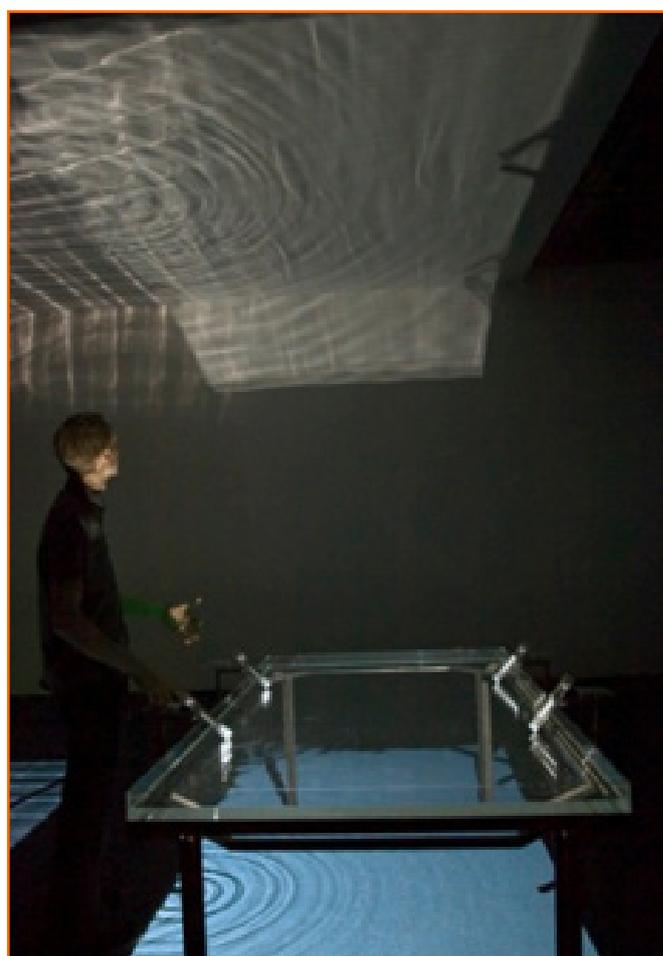


Figure 1. Rafael Lozano-Hemmer, *Pulse Tank*, 2008, NOMA Museum, Prospect 1, New Orleans Biennial, New Orleans, USA. Photo by Scott Saltzman.

2. For more references about the work of James Clerk Maxwell, please visit ‘Clerk Maxwell Foundation’. [Accessed: 17/01/ 2018]. [http://www.clerkmaxwellfoundation.org/html/further\\_documents.html](http://www.clerkmaxwellfoundation.org/html/further_documents.html).

3. The photoelectric effect is a phenomenon in which the absorption of electromagnetic radiation, as light, of sufficiently high frequency by a surface, usually metallic, induces the emission of electrons from the surface. <http://dictionary.reference.com/browse/photoelectric+effect>.

4. Blackbody radiation refers to the spectrum of light emitted by any heated object; common examples include the heating element of a toaster and the filament of a light bulb.

the artist's interest in wave theory. The installation consists of two rectangular glass water tanks located about two meters above the ground, inside a room illuminated by a spotlight located in the ceiling of the room. Visitors are invited to insert their fingers into one of four cylinders installed on the sides of the tanks. Upon touching the sensors, a computer detects the heart rates of participants and activates a solenoid whose movements create water waves in the rhythm of the visitor's pulse. In *Pulse Tank*, as waves of water create a natural light show when rays of artificial light cross them, the characteristics of light behaving like waves and waves interfering with each other are revealed.

## Surveillance: Between Care and Control

Just like light, surveillance has often led to bipolar interpretations that stretch from being a tool of control to being an important space of freedom. Light can be considered as a schizophrenic material because it contains within it different and paradoxical connotations. The tension that Lozano-Hemmer's work transmits using light is equivalent to the ethical, psychological, cultural and political problems that surround the issue of surveillance. Surveillance can be defined as the systematic monitoring of people or groups in order to regulate or govern their behaviour (Monahan 2011, 495). According to the English Oxford dictionary surveillance is close observation, especially of a suspected spy or criminal.<sup>5</sup> In other languages such as French and Spanish, the word means to watch over someone or something for the purpose of control, but also to carefully and accurately care for someone or something in order to protect it.<sup>6</sup> Along those lines, the sociologist and researcher David Lyon (2001) made the insightful observation of the ambiguous forms of surveillance that could be positioned along a spectrum from 'care' to 'control'— from watching to strengthen care and safety (e.g. a lifesaver or a nurse) to suspiciously scrutinising someone's attitudes and behaviours in order to govern, dominate or impose discipline.<sup>7</sup> In this sense, I argue that surveillance in Lozano-Hemmer's work operates simultaneously in orders of both care and control, which makes it an ambivalent tool that could be used by the elites to repress and subjugate populations or by those excluded from the arenas of power and influence to bring about conditions of collective empowerment and protection (Monahan 2011, 497).

From the 1960s until today intentions of redeploying mainstream surveillance technologies in order to defamiliarize and disrupt the normalised operations of surveillance within public space and

everyday life have been shared and applied by many artists. Bruce Naumann's *Video Corridor* (1968) is an installation located in a long passage, where visitors walk towards two monitors that project their image, which grows in size as they approach. *Virtual Intelligence Mask* (1993), by Vito Acconci, consists of three televisions that cover the eyes of a person wearing a mask. On top of the mask are two surveillance cameras that rotate mechanically from side to side. The person wearing the mask can see the environment that surrounds them on the screen. In the meantime, passers-by may switch the TV channels outside the mask, or change from one radio station to another. *i-See* (2001-2005), by The Institute for Applied Autonomy, created what consists of a web application that locates CCTV cameras in locations in New York. Krzysztof Wodiczko's *IF YOU SEE SOMETHING* (2005) is a large-scale indoor digital projection that responded to American government campaigns that encourage constant vigilance after 9/11 with the slogan "If You see Something, Say Something."

Clearly, for many decades, and increasingly after 9/11, with greater tension between the West and the rest of the world, artists have responded to surveillance as a way to move away from Orwellian dread, from the paranoid policies of scrutiny, through to the giddy pornography of Facebook, to the googlization of everything. It can be said that surveillance art has become a genre, in which various contemporary artists such as James Bridle, Paolo Cirio and Trevon Paglen specialise. For Lozano-Hemmer, surveillance technologies are an unavoidable part of our globalised society; they are tools for data generation and control that can also be used through art momentarily and playfully, destabilising binary forms of power and control.

## Lighting Subjects

The discovery of electricity during the eighteenth century and the development of electric technology in the nineteenth century gradually illuminated streets, buildings and houses. The illumination of entire cities gave visibility to the activities and relations of individuals. Light expanded notions of the act of observation and the phenomenon of being observed, fostering the notion of surveillance. Michel Foucault uses Jeremy Bentham's concept of the *Panopticon*— an Eighteenth century design for a centralised prison where cells are flooded with light to make inmates visible and detectable to an official, inconspicuously positioned in a central tower— as a diagram of modern systems of control. This self-monitoring, created by the belief that one is under

5. Definition from Oxford Dictionaries available at <http://oxforddictionaries.com/definition/english/surveillance?q=surveillance>.

6. Definition from the Real Academia de la Lengua Española available at <http://lema.rae.es/drae/?val=vigilar>. Definition from the Larousse French Dictionnaire available at <http://www.larousse.com/en/dictionaries/french/surveiller/75899>.

7. For more information about Lyon's theories and studies read: Lyon (2001, 2007).

constant observation, was intended to produce a “state of conscious and permanent visibility that assures the automatic functioning of power” (Foucault 1978, 208). *Panoptic* architecture harnessed the illuminating power of light to make things easily perceptible and visible. Electric light gave surveillance an exceptionally appropriate and natural medium, which has expanded in the contemporary era of digital technologies, institutionalising the culture of visibility in the minutiae of our daily life.

The works of Lozano-Hemmer, besides using light as a metaphor of life and reason, are also linked to the uses of light as a tool of control, which the artist defines as ‘violent light’. This term encompasses all types of light used for surveillance, interrogation and forms of human intimidation. Lozano-Hemmer considers this type of light the most important and transcendental for reading his work:

My interest in light is in the light used by American border choppers to find Mexicans. The light of interrogations. The light of the sun’s explosions. My parents were nightclub owners in Mexico City. To me light is artificiality.

Elements of surveillance technology and tracking systems can be traced back to Lozano-Hemmer’s very early works such as *Surface Tension* (1992), which consists of a colossal single eye on a screen that detects visitors and follows them in an empty room. People can move from one side of the gallery to the other, and all their movements are traced by the detection mechanisms of the mechanical eye.<sup>8</sup> The constant examination that visitors are subjected to recalls Michel Foucault’s Panopticon. In opposition to Foucault’s imagined panopticon eye that keeps prisoners in order, in *Surface Tension* there is a visible predatory electronic eye that constantly recalls the intrusive control and detection mechanisms of contemporary societies.

Lozano-Hemmer’s *Subtitled Public* (2005) uses lighting projections in an installation that consists of a computerised system that detects visitors when they enter an exhibition space and tags them with a subtitle that appears on their bodies. The computer chooses the word randomly from a list of verbs conjugated in third person, such as fights, lies, kills, bleeds, disturbs, gratifies, writes, knows, etc. The lighted word follows the visitor through the gallery, unless they make physical contact with another person, in which case they swap verbs.<sup>9</sup> The work is a comment on identification technology systems and paranoid control methods that intend to detect individuals with great precision and classify them. In *Subtitled Public*, participants anxiously start to feel judged because of their random targeting not only by a computerised system but also by the people that surround them, creating a state of tension.



Figure 2. Rafael Lozano-Hemmer, *Subtitled Public*, 2005. Photos by Antimodular Research.

In the post-9/11 era, societies evolved into a scanning culture and individuals became ‘voluntary’ objects of inspection. With the aim of preventing terrorism and protecting passengers’ lives, compulsory scrutinization was introduced not only of luggage in many airports and train stations, but also of bodies, with full-body scans. As Rachel Hall has said, there is a “willingness to open the live body, its accoutrements and possessions, as well as its digital double, to routine inspection and analysis” (Hall 2015, 132). The use of scanners is explored in *Please Empty Your Pockets* (2010), an installation consisting of a conveyor belt equipped with a computerised scanner in which visitors are invited to place all sorts of small objects that they find in their pockets: keys, pens, credit cards, condoms, mirrors, cameras, phones, wallets, coins, lipsticks, etc. Once these pass under the scanner, images of the items are then projected on the conveyor belt alongside objects of other participants that have been archived. The piece can record up to 600,000 objects, with previous participations displayed beside new ones that are added to the installation.<sup>10</sup> This work has welcomed visitors to some of Lozano-Hemmer’s solo exhibitions, recalling they security controls which people must pass through to access airports or other high-security buildings, with the difference here being the possibility of reverting control meanings by converting the process into a playful and interactive activity.

As mentioned before, electric light is intimately related to surveillance because of its ability to make things visible. The use of artificial light for police and military purposes has always fascinated Rafael Lozano-Hemmer, and his enthusiasm is reflected in the deployment of surveillance technologies in his works. Custom software, searchlights, digital microscopes, sensors, scanners and other technologies play a major role in the biometric pieces where the ambivalent connotation that technologies can have as sources

8. More documentation about the work can be found at ‘Lozano-Hemmer’ [Accessed: 09/01/2018]. [http://www.lozano-hemmer.com/surface\\_tension.php](http://www.lozano-hemmer.com/surface_tension.php).

9. More information about *Subtitled Public* (2005) is available at ‘Lozano-Hemmer’ [Accessed: 09/01/2018]. [http://www.lozano-hemmer.com/subtitled\\_public.php](http://www.lozano-hemmer.com/subtitled_public.php).

10. For further information and documentation please visit ‘Lozano-Hemmer’ [Accessed: 09/01/2018]. [http://www.lozano-hemmer.com/please\\_empty\\_your\\_pockets.php](http://www.lozano-hemmer.com/please_empty_your_pockets.php).



Figures 3. Rafael Lozano-Hemmer, *Please Empty Your Pockets*, 2010. Left: Installation view in Manchester, UK, 2010. Photo by Peter Mallet.

of freedom or control is exalted. Voice is one of the forms of human identification used in surveillance technologies, and in *Voice Array* (2011), the sound coming from participants' larynxes is translated into flashes of light with unique patterns. Incandescent light bulbs used in *Pulse Room* and *Pulse Spiral* have a double significance: the first is connected to life, ideas and electricity, and the second is their implementation inside interrogation rooms where a bulb hanging with a cable from the ceiling illuminates a solitary dark room with a seat, creating an environment of intimidation. While spotlights like the ones used in *Pulse Front* or *Pulse Park* have been used to create lighting effects in international fairs such as the Paris Universal Exposition of 1889<sup>11</sup> as well as in theatre, music and dance performances, to

illuminate bodies on stage, or more recently with marketing and advertising purposes such as the promotion of sales, festivals and other special events, they have also been implemented to illuminate movements of people in the theatre of war. Since the 19th century, searchlights have been used to blind enemies, to detect warships from a distance, for anti-aircraft surveillance, and in some places, like the US, to detect migrants crossing the border.



Figure 4. Rafael Lozano-Hemmer, *Pulse Park. Relational Architecture 14*, 2008, Ruhr Triennial, Jahrhunderthalle Park, Bochum, Germany, 2012. Sketch by Antimodular Research.

Surveillance technologies have become what Deleuze and Guattari called an *assemblage*, an intersection of various things gathered in a single context connected for diverse purposes. In opposition to the disciplinary centralised systems of Foucault's panopticon, Deleuze points out that we live in decentered societies of control where surveillance systems make individuals become *dividuals* through code regulation languages (Deleuze 1992, 5). Codes are inserted in a rhizomatic system that, as Deleuze and Guattari emphasised, "connects any point to any other point". As a rhizome that expands in the earth assuming a variety of forms, the global society of control uses a variety of technologies, some light-dependent, to extend its territory of domination and risk contention, connecting data from computing devices, networks, CCTV cameras, global positioning systems (GPS), infrared scans, facial recognition and tagging systems in social media as Facebook, and more recently surveillance lighting systems with chips and Internet-connected sensors, capable of registering any movement in any space and at any time of day.

However, while computers, networks, programmes, internet and other surveillance systems are used by governments in a predatory fashion to encroach on privacy, artists like Lozano-Hemmer choose

11. In the late 19th century and the beginning of the 20th century, international art fairs used spotlights to illuminate buildings, such as the Paris Universal Exposition of 1889 or the San Francisco International Exposition of 1915. Two interesting articles by Daniel Canogar and Erkki Huhtamo about the uses of light for international art fairs and military purposes, studied as archeological references for Rafael Lozano-Hemmer's work, can be found in Rafael Lozano-Hemmer (2000) (ed.) *Vectorial Elevation*.

to misuse them as a tool of resistance or as a crucial democratic element that could also be liberating, beneficial or pleasant for society. Surveillance has a schizophrenic dual condition of being a possible tool of freedom or control, a condition that could be related to two core elements within surveillance: bodies which, through surveillance, become machine schizocompositions of an organic and non-organic order; and light, a flexible bipolar material which oscillates between particle and wave form. This duality or multiplicity of meanings and uses creates possibilities of freedom beyond control. The many information systems to which people are exposed and that translate bodies into abstract data can be translated into code and then to light to transform subjective experiences via art. In sum, Lozano-Hemmer's work plays with various moods and heterogeneous aspects of light. His work condenses centuries of experimentation and scientific knowledge that force us to ask questions on the relationships between people, their technological environments and nature.

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