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# Transforming the Poetic Experience of Space Through Light

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Abstract

Transforming the Poetic Experience of Space Through Light

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*Transforming the Poetic Experience of Space Through Light* investigates theoretical and practical artistic methods of manipulating senses through which the space is experienced cognitively and emotionally. The focus is on innovative use of experimental lighting that engages perception, emotion, memory, and imagination. Theoretical research focuses on historical and contemporary references that demonstrate transformation of spatial experience by means of manipulating light. Studying theoretical and practical examples leads towards discovering, interpreting, and developing a novel body of knowledge for enhancing the multisensory spatial experience that provides access to transforming the perception of space in the purpose of art.

Practice based research investigates both traditional and progressive principles

of spatial design, fabrication, lighting design, audiovisual systems, and algorithmic composition. The interest is in exploiting technological advancements in lighting that can fuse perception of senses and add to the phenomenological experience of the artistic intentions. The core of the artistic research is the sublime that is inherently unknowable by reason, but accessible in experience that can be created in art.

A collected theoretical and practical body of knowledge on *Transforming the Poetic Experience of Space Through Light* is summed up and reflected in the light art installation *Horizon is an Imaginary Line*. The piece utilizes beams of light emitted from projectors positioned around a darkened space that is filled with haze and fog. Homogeneous clouds suspended in the air make light beams visible and appear perceptible by touch. These palpable light beams travel from the projector lamp across the space and form dynamic light spaces that change based on video that is projected into the state of the haze. The videos are designed to sculpt the light while emulating the vast scale of the universe and sublimity of nature. The kinetic light sculptures in tandem with the electroacoustic compositions are designed to transform the poetic experience of space.

The premise for this piece is an expansion of the lighting apparatus into immersive perceptual hyperspace. *Horizon is an Imaginary Line* examines this premise through primary research trajectories that constitute the technical and artistic foundations for the artwork:

- The Sublime
- Phenomenology
- Light Art

## Dedication

To Marijana and Branko.

## Acknowledgements

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*Horizon is an Imaginary Line* artwork was completed thanks to the enthusiastic efforts of the production team. Special thank you to Jessica Jones for her immeasurable contributions in assisting in the creation and installment of the artwork. Another special thank you to Dan Peterson for developing a compelling acoustic counterpoint to light in the piece and to Michael McCrea for assisting him. In addition, many thanks to Geoff Korf, Paul Arnold, Jay McAleer and John Bernard for generously sharing their lighting expertise. Thanks to Tony Bocci and Nick Tobin for graciously donating time and efforts to document the piece.

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## I. Context for Research

### Overview

My work is about changing the perception of space in function of art. Therefore, the subjects of my work are perception, space and, art. To change perception, I study sensation, experience, and phenomenology. To create spatial situations, I practice designing spaces, fabricating structures, manipulating materials, and integrating lighting and audiovisual systems. The core of my artistic research is the sublime.

### The sublime

#### **Ancient philosophy**

To illuminate my artistic engagement, I will elaborate on the history and theory of the sublime. While the term has had a long life full of passionate relationships with philosophers and artists who have attempted to reveal its essence, that has not led to a unified definition of its meaning. Jean de La Bruyère explores this in *The Character* when he asks,

What is the sublime? It does not appear to have been defined. Is it a figure of speech? Does it spring from figures, or at least from some figures of speech? Does the sublime enter into all kinds of writings, or are grand subjects only fit for it? <sup>1</sup>

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<sup>1</sup> Bruyere and Laun, *The Characters Of Jean De La Bruyere*.

The sublime was first mentioned in the writings of the Greek rhetorician and philosopher of the Neoplatonic school, Longinus in *On the Sublime*, which is thought to have been written between third and first century AD. Longinus described the sublime as something great, elevated, or lofty that manifests itself in what is beautiful. The concept of the sublime was further developed in the seventeenth century by British philosophers Joseph Addison, Anthony Ashley Cooper and John Dennis. They expanded Longinus' definition by introducing horror as an additional aesthetic quality that can cause the sublime. After embarking on the Grand Tour of the Alps, John Dennis described it as a "delight that is consistent with reason" and "pleasure to the eye as music is to the ear," but also "mingled with Horrors, and sometimes almost with despair."<sup>2</sup>

### **18th century philosophy**

Several years later, British statesman and philosopher Edmund Burke proclaimed that horror is not only another potential source of the sublime, but the most potent one. In 1756 he published *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*. In Part I, Section VII, Burke wrote: "Whatever is fitted in any sort to excite the ideas of pain, and danger, that is to say, whatever is in any sort terrible, or is conversant about terrible objects, or operates in a manner analogous to terror, is a source of the sublime; that is, it is productive of the strongest emotion which the mind is capable of feeling." In Part II, Section II: "Terror is in all cases whatsoever, either more openly or latently, the ruling principle of the sublime."<sup>3</sup>

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<sup>2</sup> Longinus, *On Great Writing (On the Sublime)*.

<sup>3</sup> Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*.

Prominent German philosopher Immanuel Kant followed Burke's enquiry in 1790 by writing theory of aesthetics that was published in *Critique of Judgment*. In the chapter *Analytic of the Beautiful*, Kant disassociates the beautiful from the sublime. While the beautiful is concrete, "it is connected with the form of the object," the sublime is intangible, "it is to be found in a formless object."<sup>4</sup> Beauty can be reasoned, but to experience the sublime it is necessary to go beyond reason and employ sensibility and imagination. The ability to transcend reason by fusing it with the nature of senses is the vehicle of the sublime that Kant calls a "supersensible substrate."<sup>5</sup> He attributes it to individuals who pose both superior mindfulness and superior sensibility of the body.

The magnitude of a natural object on which the imagination fruitlessly spends its whole faculty of comprehension must carry our concept of nature to a supersensible substrate (*übersinnliche Substrat*) (which lies at its basis and also at the basis of our faculty of thought). As this, however, is great beyond all standards of sense, it makes us judge as sublime, not so much the object, as our own state of mind in the estimation of it.<sup>6</sup>

It is not the object that is sublime but we get into the sublime state of mind, it is in the experience. We experience the sublime when our imagination fails to conceive the greatness of events solely by means of reason but compensate this failure with pleasurable sensations that can be manifested through synthesis of nature of senses with virtue of reason. Sublime as an experience is noumenonal, a thing-in-itself, postulated by practical reason but existing in a condition which is in principle unknowable. Gilles Deleuze paraphrases Kant, "It is not the body

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<sup>4</sup> Kant, *The Critique of Judgment*.

<sup>5</sup> *Ibid.*

<sup>6</sup> *Ibid.*

that realizes, but it in the body that something is realized, through which the body itself becomes real and substantial."<sup>7</sup>

### **The religious sublime**

Kant's theory prompted even more vivid discussions about the nature of the sublime that suggests new possible frameworks for the subject. None of which was accepted as unique model of the concept through which they demonstrated the impossibility to frame the sublime, and as such confirmed Kant's definition of it as the unknowable. If what we experience is unknowable, the question is how do we experience the unknowable. All the previous theories depicted it as both wonderful and terrible. Multiplicity of that experience, the dichotomy between bliss and horror, beauty and ugliness, pleasure and pain, comfort and torment, divine and hell as distinct instances of the single sublime that can be experienced through integration of cognitive and sensory abilities, which is the most persistent in religious mythology. Religions that promote transcendence through light and darkness have illustrated the sublime as the crossing point towards the numinous, the presence of a divinity.

I know some people are of opinion, that no awe, no degree of terror, accompanies the idea of power; and have hazarded to affirm, that we can contemplate the idea of God himself without any such emotion. I purposely avoided, when I first considered this subject, to introduce the idea of that great and tremendous Being, as an example in an argument so light as this; though it frequently occurred to me, not as an objection to, but as a strong confirmation of, my notions in this matter.

Edmund Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*, 1756<sup>8</sup>

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<sup>7</sup> Deleuze, *The fold*.

<sup>8</sup> Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful*.

According to the German theologian Rudolf Otto, crossing the bridge of the sublime is encouraged both by *mysterium tremendum et fascinans* (“fearful and fascinating mystery”), the pains and terrors overwhelming those who have arrived affront of God, and “nostalgia for paradise”<sup>9</sup>, aching desire to reach the abode of perfection. In Christianity, the God is light, but the God is also darkness.

And the light shineth in darkness; and the darkness comprehended it not.

John 1:5, *King James Version of the Bible*, 1611<sup>10</sup>

Myths of heaven and hell have functioned to interpret the world and its counterparts, but also to entice the audience into experiencing its parts. The enticement into the fearful and blissful mystery is where the art comes in.

### **20<sup>th</sup> century philosophy**

Postmodern French philosopher and literary theorist. Jean-François Lyotard, recognized the avant-garde art as a novel opportunity for accessing the sublime. He argued that the nature of the avant-garde modern art has the unique potential to manipulate the balance of senses, reason, and emotion in a manner that results in a sensation of pleasurable pain. Further investigation leads to the practice of art that carefully entices senses, reason, and emotion in a way that results in feeling the unknowable.

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<sup>9</sup> Otto, *The Idea of the Holy*.

<sup>10</sup> Shaddai, *Bible (King James Version)*.

Thought must 'linger,' must suspend its adherence to what it thinks it knows. It must remain open to what will orientate its critical examination: a feeling.

Jean-François Lyotard, *Answering the Question: What is Postmodernism?, The Postmodern Condition: A Report on Knowledge*, 1984<sup>11</sup>

Nineteenth century Danish philosopher, theologian, and psychologist Søren Kierkegaard argued that logic of the objective knowledge and rational belief is unimportant to existence. If the deity could rationally be argued, existence of the supernatural being would be unimportant to humans. It is because God cannot rationally be proven that his existence is essential. Kierkegaard wrote, “Without risk there is no faith. Faith is precisely the contradiction between the infinite passion of the individual’s inwardness and the objective uncertainty. If I am capable of grasping God objectively, I do not believe, but precisely because I cannot do this I must believe.”<sup>12</sup>

The sublime, as an agnostic term, cannot be made into an object of knowledge through language, reasoning, logic, and concepts; however, it can be experienced. Because it is unknowable but experiential, it is profoundly valuable to experience it. My interest is the experience of the inherently unknowable sublime that has been described in extremes like awe and terror. Variations of the experience include extremes like the dark and the light, the beautiful and the ugly, the bliss and the agony, the true and the false, the sacred and the profane, the good and the evil, the pleasure and the pain, and so forth. I focus on the division and range between two mutually exclusive, opposed, or contradictory sensations, as distinct instances of the single sublime. Therein lies the opportunity for the multiplicity of an experience, which can also be created in art.

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<sup>11</sup> Lyotard, *The Postmodern Condition*.

<sup>12</sup> Kierkegaard, *Kierkegaard’s Writings 12 Vol. 1 12 Vol. 1*.

The sublime object is of a dual sort. We refer it either to our power of apprehension and are defeated in the attempt to form an image of its concept; or we refer it to our vital power and view it as a power against which our own dwindles to nothing. But even if, in the first case or the second, it is the Occasion of a painful awareness of our limitations, still we do not run away from it, but rather are drawn to it by an irresistible force. Would this be even possible if the limits of our imagination were at the same time the limits of our power of apprehension? Would we so gladly accede to the reminder of the overwhelming power of natural forces if we did not possess something else in reserve which need not fall prey to those forces? We delight in the sensuously infinite because we are able to think what the senses can no longer apprehend and the understanding can no longer comprehend. We are ravished by the terrifying because we are able to will that which our sensuous impulses are appalled by, and can reject what they desire. We gladly permit the imagination to meet its master in the realm of appearances because ultimately it is only a sensuous faculty that triumphs over other sensuous faculties; but nature in her entire boundlessness cannot impinge upon the absolute greatness within ourselves. We gladly subordinate our well-being and our existence to physical necessity, for we are reminded thereby that it cannot command our principles. Man is in its hands, but man's will is in his own hands.

Friedrich Schiller, *On the Sublime*, 1801<sup>13</sup>

### **Contemporary artscience**

Leading scientists, art historians and artists such as astronomer and art researcher Frank Malina have resuscitated discussions about the sublime. He is reflecting on the problematic of human capability to comprehend scientific findings of our time. Example of the fundamental unknowables is the discovery of the finite speed of light. In *The Sublime in Art and Science* Malina argues that the lack of scientific understanding of the unknowable phenomena can be compensated by artistic interpretations of it, “The ‘light cone’ defines the space-time envelope of causally related events. Even though we are in an infinite universe, the finite speed of light means that what is happening in parts of the universe that are farther way than the light travel age of the universe, these events are unknowable. Similarly events that are occurring inside the horizon of a black hole, these events are not only un-observable to outside observers but un-

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<sup>13</sup> Schiller, *Naive & Sentimental Poetry; On the Sublime*.

knowable to them. It seems to me that these unknowables in science become another reservoir for the scientific Sublime.”<sup>14</sup>

### Phenomenology

#### **Experiential range in art**

Contradictions of the sublime have been depicted in art since the beginning of art history. The range from hell, through purgatory, to heaven can be traced in the *Sumerian myth of Inanna, Queen of Heaven and Earth*, *Egyptian Book of the Dead*, *Bible*, Homer’s *The Odyssey*, Dante Alighieri’s *Divine Comedy*, John Milton’s *Paradise Lost*, *Illuminated manuscript*, Hieronymus Bosch’s triptych painting *The Garden of Earthly Delights*, Luca Signorelli’s fresco of *The Apocalypse* and *The Last Judgment*, in *Orvieto Cathedral* and Michelangelo’s *The Last Judgment* in the Sistine Chapel, William Blake’s *The Marriage of Heaven and Hell*, Ludwig van Beethoven’s *Ninth Symphony*, Gustav Mahler’s *The Symphony No. 8*, and so forth. The amount of artistic expressions that depicts the concept of the sublime through heaven and hell support its emphasis in society. However, these works differ in a degree of simulating and emulating the experience of the sublime. For example, Dante’s *The Divine Comedy*<sup>15</sup> uses the narrative to create a representation of soul’s journey through Inferno, Purgatorio, and Paradiso. It simulates, illustrates, and projects the idea of experiencing Dante the Pilgrim’s journey. To a degree, it also emulates and induces the actual feeling of being on a path from hell to heaven. It forces one to experience *The Divine Comedy* as if we were the protagonist of the story. This is a representational narrative of the sublime embedded in the life of an everyday sinner.

My interest is in works of art that predominantly emulate the experience of the sublime,

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<sup>14</sup> Woodward et al., *Leonardo Reviews Quarterly* 2.01.

<sup>15</sup> Alighieri and Longfellow, *The Divine Comedy*.

which are aligned with twentieth century French philosophy includes the thinking of Jean Baudrillard, Gilles Deleuze, Jean-François Lyotard, Michel Foucault, Jacques Derrida, and Jacques Lacan. Their works are in the domain of post-structuralism, which view the structural relationship between the signifier and signified as inseparable but not united. In the artistic discourse the structure creates nonlinear meaning, and the audience replaces the author as the primary subject of inquiry. These ideas extend to the philosophical concept of phenomenology that focus on the viewpoint of "first person", which can then be examined as phenomena that not only appears to "my" consciousness, but to all consciousness. According to German philosopher Edmund Husserl, the synthesized experience is what constitutes as total human knowledge.<sup>16</sup>

#### **Experiential range in art of J.M.W. Turner**

One of the first artists exploring the phenomenological experience of the sublime was English Romantic landscape painter Joseph Mallord William Turner. His most notable painting, the *Snowstorm: Steamboat Off a Harbour's Mouth Making Signals in Shallow Water* (1842) portrays a ship in distress off the English coast with a high degree abstraction, asymmetrical composition, and monochromatic palette. The painting documents the event of the ship caught in the storm by depicting the experience of witnessing the ship in the storm, instead of merely realistically reproducing the look of the scene. The painting not only informs us about what happened to the steamboat at the Harbour's Mouth during the snowstorm, but it also physically immerses us into the event. It is a beautiful and terrifying visceral experience, creating an example of the sublime in painting.

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<sup>16</sup> Husserl, *Ideas*.



Figure 1: Joseph Mallord William Turner, *Snow Storm—Steam Boat off a Harbour's Mouth Making Signals in Shallow Water, and Going by the Lead, 1842*

### 20<sup>th</sup> century expansion of experiential art

Several centuries after Turner, vision as the highest in the historical hierarchy of senses was slowly making space for other senses—and a fuller sensory experience. Artists including Anish Kapoor, Mark Rothko, Bill Viola, and James Turrell marked the twentieth century as an age of expanding our sensing apparatus to experience the sublime. Through their abstract but integrated use of materials, space, color, light, and image excite our senses and intrigue our minds to the point of reaching the essence of the unknowable. Postmodern philosopher Jean-François Lyotard, referenced the works of such artists in *The Postmodern Explained: Correspondence*, “The postmodern would be that which in the modern invokes the unrepresentable

in presentation itself, that which refuses the consolation of correct forms, refuses the consensus of taste permitting common experience of nostalgia for the impossible, and inquires into new presentations—not to take pleasure in them, but to better produce the feeling that there is something unrepresentable.”<sup>17</sup>

Anish Kapoor works in a large-scale sculpture with a variety of materials and color, which combines a sense of sight and touch into a sense of space. Mark Rothko applied complex technical procedures in abstract painting to use color and surface for creating a sense of space. Bill Viola integrates moving images and sounds at specific sites to fuse the senses and change the experiential topology of those spaces; whereas, James Turrell uses light and architecture of the space to create perceptible shift from being in the physical reality to the metaphysical reality of the space.



Figure 2: Anish Kapoor, *Svayambh*, 2007

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<sup>17</sup> Lyotard, *The Postmodern Explained*.



Figure 3: Mark Rothko, *Four Darks in Red*, 1958

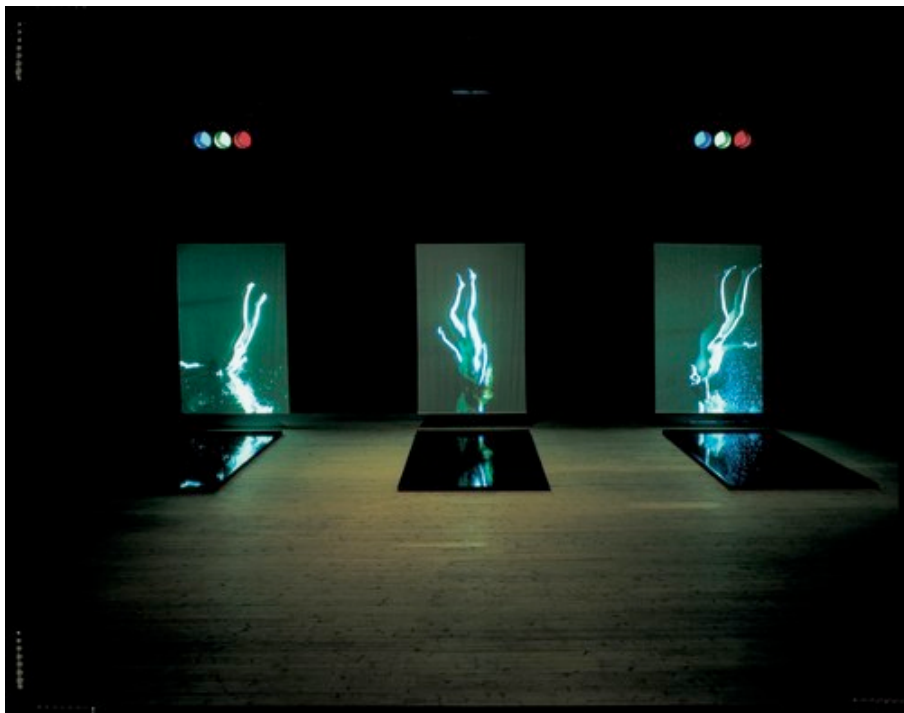


Figure 4: Bill Viola, *Stations*, 1994



Figure 5: James Turrell, *Bridget's Bardo*, 2009

The success of their work is in experimental manipulation of senses through which we experience the space cognitively and emotionally. Their innovative use of materials that engages our sight, hearing, touch, smell, emotion, memory and imagination transforms the spaces that they work in into places that demonstrate the existence of the “unpresentable.”

Intentional inclusion of all the senses into a total experience was introduced back in 1849 when Richard Wagner conceived of a *Gesamtkunstwerk*, “Total work of art”, known as an operatic work for the stage that was inspired by ancient Greek theater that integrated all the major art forms: painting, writing, music, etc. In Wagner’s operatic works, architecture, ambience, and even the audience itself were designed in order to achieve a state of total artistic immersion. With the arrival of film and prominence of video in 1960s, technology became a mean of adding to the total immersive art experience, which evolved into interconnected interactive multimedia environments.

## 21<sup>th</sup> century multisensory spatial art

Exploiting the technological advancements that fuse the perception of senses and add to the phenomenological experience of my artistic intention of presenting the presence of the “unpresentable” has been my artistic focus.

My perception is [therefore] not a sum of visual, tactile, and audible givens: I perceive in a total way with my whole being: I grasp a unique structure of the thing, a unique way of being, which speaks to all my senses at once.

Maurice Merleau-Ponty, *Phenomenology of Perception*, 1962<sup>18</sup>

To be fully present in an environment, one needs to use all available senses and intimately interact with the surroundings through their eyes, nose, ears, and skin. The body is placed in the center.

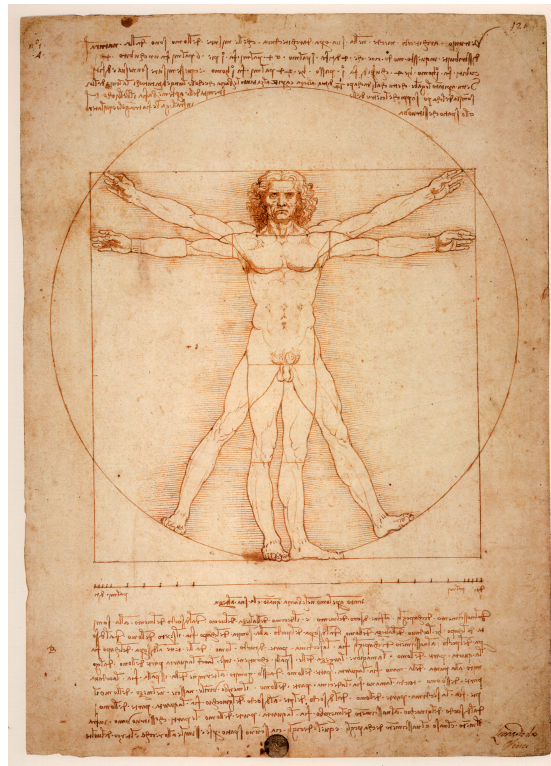


Figure 6: Leonardo da Vinci, *Vitruvian Man*, c. 1490

<sup>18</sup> Merleau-Ponty, *Phenomenology of perception*.

Only through receptiveness of the entire sensing mechanism, is it possible to have a profound sensation of the place that can then be emotionally and cognitively processed into a meaningful experience. In the context of art, maximized engagement of the senses can direct memory and imagination into a place where the sublime can be experienced.

The phenomenological approach of the artist implies a pure looking at the essence of things, unburdened by convention or intellectualized explanation. All artists, including film directors, are phenomenologists in the sense that they present things as if they were objects of human observation for the first time. Architecture re-mythologizes space and gives back its pantheistic and animistic essence. Poetry returns the reader back to an oral reality, in which words are still seeking their meanings. Art articulates the boundary surface between the mind and the world.

Juhani Pallasmaa, *The Architecture of Image: Existential Space in Cinema*, 2001<sup>19</sup>

### Light Art

#### **Light**

Science is spectral analysis. Art is light synthesis.

Karl Kraus<sup>20</sup>

Light is basic, indispensable, and a necessary substance of the universe. It is a visible and invisible energy that travels through space to enable and define life, but also holds information about the origin and evolution of the Universe. Humans receive light through sensors that are located in the back of the eye and it then passes to the brain's network of 100 billion neurons and up to 5 quadrillion connection points between neurons that shape our perception of reality.

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<sup>19</sup> Pallasmaa, *The Architecture of image*.

<sup>20</sup> Hansen, Nagy, and O'Leary, *Deblurring Images*.

Earth's most significant and powerful source of light is also the center of the Solar System – the Sun. With a surface temperature of about 5500° C, the Sun is extremely hot, incandescent, and produces vast amounts of visible and invisible light. The light produced from the Sun is white light, which is actually a blend of different colors of light known as the visible spectrum. About 44% of the Sun's electromagnetic radiation that reaches the ground is in the visible light range. Light travels from the Sun to Earth in about 8 minutes and 19 seconds. The energy of this sunlight supports almost all life on Earth by photosynthesis and drives Earth's climate and weather. The enormous effect the Sun has on the Earth has been recognized since prehistoric times; as a result, it has been regarded by some cultures as a deity and holds a prominent role in most religions, mythologies, and art. An accurate scientific understanding of the Sun slowly developed and as late as the 19th century, prominent scientists still lacked a great deal of knowledge with regards to the Sun's physical composition and source of energy. Even in the present day, scientists have not achieved the full understanding of the Sun. It is not fully explained how the solar system was born, how will it end, or how many solar systems there are. Despite the technological advances, our society is still confronted with a reality that cannot be grasped in its fullness. The Universe, the Sun, and the light remain inherently unknowable and incomprehensible; as such they provoke anticipation of discovery. Such anticipation of the ecstatic resolution resides in the domain of the sublime that awakens awe, wonder and terror. Philosopher Immanuel Kant recognized it as a 'mathematical' sublime that is concerned with things that have a great magnitude in and of themselves.

Vision, I say, is related to light itself. But of this sensation and the things pertaining to it I pretend to understand but little, and since even a long time would not suffice to explain that trifle, or even to hint at an explanation, I pass over this in silence.

Galileo Galilei, *The Assayer*, 1623<sup>21</sup>

Captured raw light that is scientifically recognized as a source of life has still not been utterly understood, it remains wondrous and unknowable in its fullness. What the sciences do know by now is that the nature of light is inherently algorithmic. It follows a set of physical laws and variations that precisely define a sequence of light's behavior. One of algorithmic properties of light is randomness, quantum randomness was known to Albert Einstein as early as 1926 from theoretical deliberations. In 1905, Einstein proposed the existence of the photon, an elementary particle associated with electromagnetic radiation (light). In later experiments it was shown that a single photon is either reflected or transmitted at the beam splitter, and never actually splits. It cannot be predicted which way the individual photon will take. Light is not deterministic as classical physicist believed but algorithmic and has been studied as such by the field of natural computing and algorithmic bioprocesses that focuses on algorithmic self-assembly, sequence discovery, generation, process calculi and automata, biochemical reactions, molecular evolution, cellular automata, evolutionary computing, and other topics that inform the relationship between science of light and the logic of computer science.

The properties of light have fascinated mankind since the beginning of history, which is evident in art that dates back to the prehistoric time. Archaeologist Marc Azéma of the University of Toulouse–Le Mirail claims that by around 30,000 years ago, Paleolithic artists used "animation effects" in their paintings through their composition and by relaying on the flickering torchlights.<sup>22</sup> The images look superimposed until flickering torchlight is passed over them, giving them movement and creating a brief animation.

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<sup>21</sup> Galilei, *Discoveries and Opinions of Galileo*.

<sup>22</sup> Azéma, Clottes, and Tavernier, *Préhistoire du cinéma*.



Figure 7: *The Chauvet Cave Painting*, ca. 30 000 b.c.

This kind of consideration of light and understanding of perceptual phenomena as persistence of vision resulted in experimental manipulation of senses through which the light, space, and time is experienced cognitively and emotionally. In so, light interests me as a medium, but also as a medium that is the message.

### **Light Art History**

Light has been used as a medium of expression since prehistoric times until today. The importance of the play of light and shadow has been accounted for across disciplines and ages. For instance, Leonardo da Vinci studied light both as an artist and a scientist. He wanted to understand the natural forces and so he explored mathematics, physics, optics, botany, zoology, mechanics, hydraulics, astronomy, philosophy and other disciplines that explained anatomy of

the human eye, nature of light, and mechanics of camera obscura, first camera. His studies made him a master of light in painting that depict reflection, shadow and color in detail.

Light especially plays a significant role in sacral spaces as a mean to discover the space, both physically and metaphysically. Churches, mosques, synagogues, temples, and other places of worship gather people around flickering candles in spaces designed to achieve the mystical quality of light that reflects in the interiors and as such evokes the presence of a superior being in a larger space. These spaces are also designed to let natural light pass through the material of the building and be reflected inside of the space. Such architecture promotes the mystery of light and utilizes it as a religious symbol of the divine or celestial light presence.

The innovative treatment of light has revolutionized visual art in the 19<sup>th</sup> century when impressionists departed from realistically depicting historical events and turned their attention to conveying the sensations of space and time through delicate treatments of light. Their paintings were created through interplay of light and color in order to achieve an atmosphere, an immaterial experience.

For me, a landscape does not exist in its own right, since its appearance changes at every moment; but the surrounding atmosphere brings it to life - the light and the air which vary continually. For me, it is only the surrounding atmosphere which gives subjects their true value.

Claude Monet, *Monet by Monet*, 1990<sup>23</sup>

The modern concept of light art emerged with the development of artificial light. Thomas Alva Edison's invention of the electric light in 1879 profoundly changed our civilization by

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<sup>23</sup> Monet, *Monet by Monet*.

illuminating the darkness and providing different applications of electricity in everyday life. Artists started experimenting with various electric light sources by using light as a material and subject in their works.

A key figure in establishing a history of light art is Danish-born inventor and singer Thomas Wilfred (1889-1968). He created handmade machines that produce moving images, which he called "lumia," or compositions of light in time. "The artist's sole medium of expression is light,"<sup>24</sup> he wrote in 1947. In his process he included reflective mirrors, hand-painted glass discs, and bent pieces of metal--all housed in a screened wooden cabinet, or, in one case, mounted on a walnut "tea wagon" to transform beams of light produced by a series of lamps and lenses. In 1921, Wilfred had completed his first light instrument, the *Clavilux*, an elaborate and intricate color organ. The *Clavilux* mechanism is concealed in a wooden housing and uses a reflective mirror and bent pieces of metal to shape light thrown by a series of lamps and lenses. A series of projectors then cast images onto a screen or surface. The *Clavilux* player controls the hues and shapes with a piano-like keyboard, which produces slowly morphing chimeras of shifting form and vibrant color, a flame with striking brilliance.

Light is the artist's sole medium of expression. He must mold it by optical means, almost as a sculptor models clay. He must add colour, and finally motion to his creation. Motion, the time dimension, demands that he must be a choreographer in space.

Thomas Wilfred, *Light and the Artist*, 1947<sup>25</sup>

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<sup>24</sup> Betancourt, *Thomas Wilfred's Clavilux*.

<sup>25</sup> Ibid.



Figure 8: Thomas Wilfred, *Lumia*, 1933-1942

The term Light Art was coined by contemporaries of László Moholy-Nagy who recognized him as a pioneer of what is known as Light Art. Moholy-Nagy was one of the leading members of the German Bauhaus where he worked as a painter and photographer, dealing predominantly with light. His “photograms” were made directly on film, and his “light-space modulators” included dynamic light effects. In the 1930s he moved to Chicago, where he formed the New Bauhaus and pioneered lumino kinetic art in America.



Figure 9: László Moholy-Nagy, *Light-Space Modulator*, 1930

As technology advanced from the invention of the electric light bulb to the photography, cinema projection, and computer screens; artists continued experimenting with actual light as material and subject. New wave of artists, including Yves Klein, Jean Tinguely, and Lucio Fontana, arrived on the scene after World War II. They were intent to free art from its conventional formatting constraints and integrating all of the space that art occupies. The “Zero” group founded in Germany by Heinz Mack and Otto Piene in 1958 soon attracted other artists and became an international movement. In Otto Piene’s *Mechanisches Lichtballett* (*Mechanical*

*Light Ballet*), light travels through fabric balloons and perforated metal discs, resulting in a play of light and shadow across the darkened room. Another representative of the movement, György Kepes talked about his relation to light in interview for *Form* magazine in 1929, “Spatial experience is intrinsically connected with the experience of light space in a visual sense is light-space the sensory modes of registering the modulated light, the various sensations of color, then become the means for spatial ordering of objects and events.”

Light artists in France formed the *Groupe de Recherche d’Art Visuel (GRAV)* in 1960, which included François Morellet and Julio Le Parc among its members. They developed further the work with new technologies, the relationships between light and motion, and demonstrating visual phenomena that led to the *Op Art (Optical Art)* movement. *Op Art* focuses on visual perception by employing optical illusions and as such also made an impact on treatment of light in art. Work of Carlos Cruz-Diez, Heinz Mack, Bridget Riley, Günther Uecker, Victor Vasarely, etc., use structural reliefs, matrices of light and letters, and color contrasts intended to stimulate the perception.

In the United States, the minimalist Dan Flavin created sculptures and installations from commercially available fluorescent light fixtures. Such work became recognized as light sculpture, “an intermedia and time-based art form in which sculpture or any kind of art object produces light, or the reverse (in the sense that light is manipulated in such a way as to create a sculptural as opposed to temporal form or mass).”<sup>26</sup>

The most influential contemporary figure in light art has been James Turrell who was born in Los Angeles in 1943. Turrell’s work involves explorations in both natural and artificial light, outdoor and indoor space and it is meant to provide viewers access to a realm of pure

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<sup>26</sup> “Light Art.”

experience. His most notable work is situated near the Grand Canyon and Arizona's Painted Desert is Roden Crater, an extinct volcano, where he has been designing a network of tunnels and underground rooms for the last thirty years. It is still in process of being transformed into a celestial observatory, gateway to the outer space that attempts to locate mankind's place in the universe. Turrell embraces the fluency of natural light changes as an emulation of transcendence. In *Roden Crater* and other works such as *Skyspace* series, Turrell designs spaces as an oculus for witnessing the change of light and time.



Figure 10: James Turrell, *The Roden Crater Project*, 1974 - present



Figure 11: James Turrell, *The Roden Crater Project*, 1974 - present

Turrell's work also breaks ground for sculpture with his light interventions that change the experience of space. For example, Turrell's *Milk Run* at the Hirshhorn Museum and Sculpture Garden in Washington, D.C. is an installation in a seemingly pitch-black room with recessed lighting to create a particularly uncanny atmosphere. Entering the darkened space, the visitors see a multi-hued wedge of light that forms an illusory volume - a form that shifts in relation to the viewer's movements.

Notable contemporary light artists include, Chul Hyun Ahn, Olafur Eliasson, Spencer Finch, Dan Flavin, Jenny Holzer, Ivan Navarro, James Turrell, Bruce Munro, Keith Sonnier and Leo Villareal. In addition to artists who provided direct legacy for contemporaries, Gyula Kosice, Lucio Fontana, Martial Raysse, Chryssa, François Morellet, Joseph Kosuth, Bruce Nauman, and Piotr Kowalski. New technological advances radically affect the treatment of light and provide the new approach in creation of multisensory spaces. They invite the viewer to discover the space by moving within the space and interacting with light in it to achieve a higher level of perception.

## II. Horizon is an Imaginary Line

### Overview

#### **Description**

The light of memory, or rather the light that memory lends to things, is the palest light of all. . . . I am not quite sure whether I am dreaming or remembering, whether I have lived my life or dreamed it. Just as dreams do, memory makes me profoundly aware of the unreality, the evanescence of the world, a fleeting image in the moving water.

Eugène Ionesco, *Present Past—Past Present*, 1996<sup>27</sup>

This passage illuminates the process of research, manifestation, and poetic discovery within the *Horizon is an Imaginary Line* artwork. The approach reflects DXARTS art and research methodologies, building upon the integral idea that new form emerges from resurrection of relevant historical foundations integrated with technological experimentation and innovation.

The *Horizon is an Imaginary Line* premiered in Seattle, Washington, USA, at the Jones Playhouse Theatre on July 8, 2013. The installation artwork is open for up to 6 people and runs for 20 minutes at a time. It utilizes experimental light and electroacoustic compositions to transform the experience of the Jones Playhouse Theatre space into a poetic experience of nature. The main medium is light and transformation of the immaterial sensation of light by projecting animation of simple geometric patterns and references to nature into a material experience of the constructed landscape. It creates light sculptures by means of re-appropriating cinematic technologies, and holds a lineage that traces back to the abstract paintings of artists like Mark Rothko and before him, Joseph Mallord William Turner where the perception of landscape is treated as a vehicle for numinous.

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<sup>27</sup> Ionesco and Lane, *Present Past, Past Present*.

## Team

### Production Credits

**Art & Direction:** Maja Petric

**Light:** Maja Petric

**Animation:** Maja Petric

**Video:** Maja Petric

**Sound:** Daniel Peterson

**Space:** Maja Petric

**Technical Coordination:** Jessica Jones

**Technical Crew:** Jessica Jones, Paul Arnold

### **Produced with generous support from:**

DXARTS: Center for Digital Arts and Experimental Media,

University of Washington

School of Drama, University of Washington

## Context

Light is not so much something that reveals, as it is itself the revelation.

James Turrell, *Mapping Spaces*, 1987<sup>28</sup>

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<sup>28</sup> Turrell, *Mapping Spaces*.

Lighting in the *Horizon is an Imaginary Line* is a result of experimenting with the light beams coming out of the projectors when playing videos. Such process includes creation of moving images and feeds from the heritage of cinema and video art. By this age cinema has developed complex relationship with contemporary visual and media arts. It is often used outside of it's own context and placed into the territory of art where in some cases becomes almost unrecognizable. The cinematic re-appropriation has been the approach of artists such as Matthew Barney, Shawn Brixey, Victor Burgin, James Coupe, Philip-Lorca diCorcia, Stan Douglas, Ivan Faktor, Nan Goldin, Douglas Gordon, Cindy Sherman, Jeff Wall, etc. The framework of cinema has been reconstructed even more in installation art by artists such as Ann Hamilton, Mona Hatoum, Gary Hill, Anthony McCall, Pippolotti Rist, Bill Viola, and others.

These artists many times create multimedia environments that explore the relationship between cinematic and real space. Films and videos are used to examine space through the immaterial play of light and sound. The exhibit space becomes carefully staged environment in which artists are no longer representing the world we live in, but create a world for participants to inhabit. Viewers are turned into participants and in turn their experience is transformed into a straightforward viscerally immersive experience. Such artworks explore the themes of time, memory, and transition from material into immaterial.

An example of this is Bill Viola's video art installation *Tiny Deaths*, which consists of three large projections that appear on the walls of a completely black room. They are barely perceivable in the darkness. A human figure gradually emerges as a dim silhouette is covered in a field of noise. Obscure voices are quietly talking. Randomly, a light source slowly illuminates one of the figures, rapidly increasing in intensity until the light abruptly consumes their whole body in a burst of white light. In the same time, the burst of light for a moment also illuminates

the room and washes out the other two projections. Quickly all returns to darkness until one of the other projected figures moves through the same transformation from material into immaterial and vice a versa.

A pioneering artist in transforming the immaterial quality of cinema into material is Anthony McCall, an experimental filmmaker who developed in the 1970s *Solid Light Films*. These "movies" are projections in a space filled with mist which. In McCall's work *Line Describing a Cone* from 1973, he gradually unfolds a line into a cone over a period of around forty minutes, which results in a simple cone light. McCall places cinema projector at one side of the exhibition hall and projects 16 mm film of a bright spot that over time grows slowly to form a small line and a parabola, and finally, a full circle thus producing a cone of light from the projector and the wall facing viewers. The space is filled with fog to reveal the volumetric aspect of the projected light. Shadows, shapes, clouds, interplays of transparency and opacity, constant change shifts, and unstableness are then transformed into light that feels like palpable material. The films *Solid Light* have been revived in last ten years. In recent performances, multiple projectors are incorporated with light beams in heterogeneous forms (sinusoidal and others), cross and meet in space. In each instance, the principle remains the same to essentially highlight the forgotten film projection space that lives in a gap between subjective experience and objective reality.

While McCall's *Solid Light* work has not changed much in last forty years, the context of his work is considerably different. Art writer Adrian Searle has critiqued this aspect of McCall's work in a recent article, "The world rediscovering this one film, and advances in film and projection technology, enticed McCall back to this type of work. That said, his installations, however well produced (and nowadays computer-plotted and made with the assistance of

mathematicians), are still pretty much in the province of 19th-century smoke-and-mirrors special effects - or, in this case, haze-and-DVD-projector special effects. None makes any real advance on that first ephemeral illusion of a cone. Hard-edged planes of light sheer the darkness in a slow choreography, as the light paints sine waves, ovals and vectors on the wall. "Go towards the light," an unseen voice commands. "Don't go," a more sensible voice implores. So I don't."<sup>29</sup>

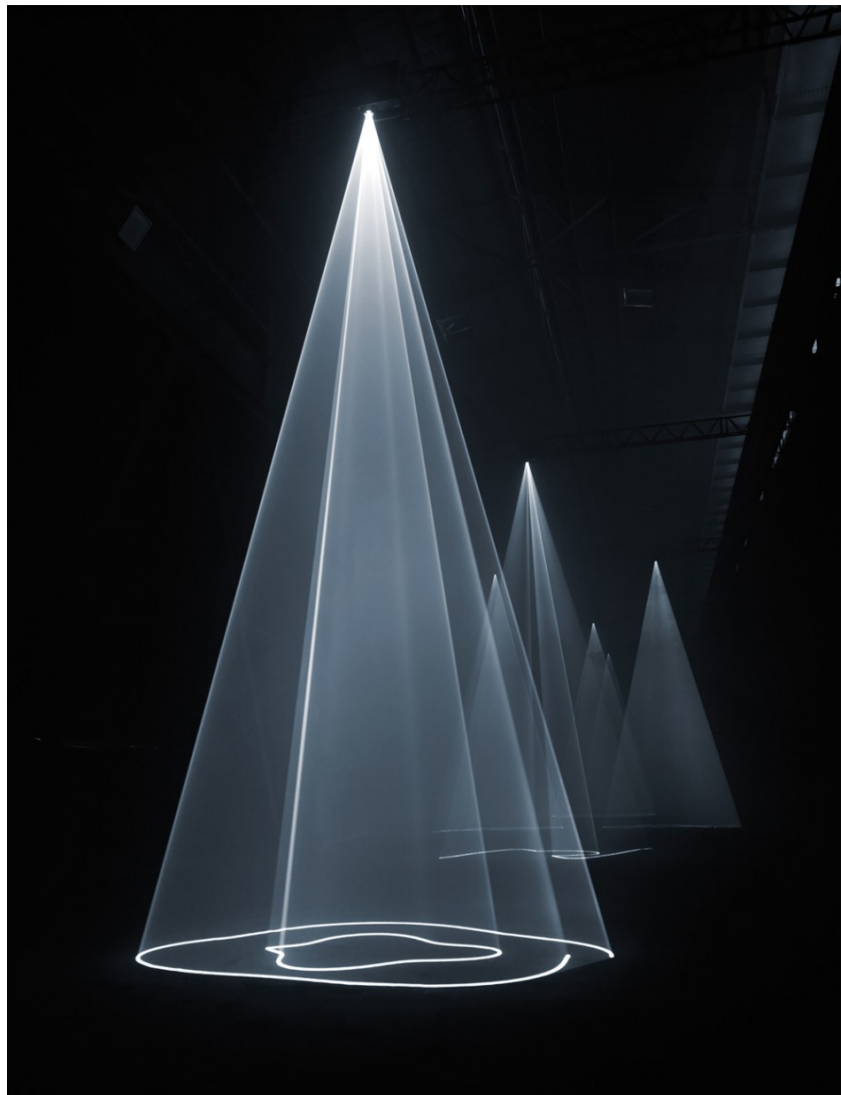


Figure 11: Anthony McCall, *Vertical Works*, 2009

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<sup>29</sup> Searle, "Catch Some Rays."

Olafur Eliasson's work also resigns in a territory of installation art that employs light as a main medium. He often builds spaces designed to disorient the occupants. One of the materials he uses to do so is vapor, mist or synthetic smoke suspended in the air onto which he shines light as seen in the following works: *Feelings Are Facts*, *Din Blinde Passager*, *The Mediated Motion*, *The Weather Project*, *Your Blind Movement*, *Your Atmospheric Color Atlas*, and *Yellow Fog*. All of these artworks appropriate natural materials and harness natural processes, which imply transcendent experience but also disrupt it by intentionally exposing machines that produce these phenomenal matters. For *The Mediated Motion* at the Kunsthaus Bregenz in Austria in 2001, Eliasson created a series of spaces filled with natural materials including water, fog, earth, wood, fungus and duckweed. While going through the exhibition, visitors were immersed in multisensory experiences encompassing sights, smells, and textures that changed its state from one point to another. *The Weather Project* was a large-scale installation of the artificial sun made up of hundreds of mono-frequency lamps that light the entire Turbine Hall of Tate Museum in 2003. A giant sun like object was placed in a mirrored mist filled environment that at times formed cloud-like shapes and then would again dissipate across the space. The arc is repeated in the mirror on the ceiling, which produces an aura of glowing radiance linking the real space and the reflection into a total atmosphere of material fusing with the immaterial.

These large-scale installations are created to provide a mass experience but depend on the subjectivity of perception. Similarly as weather phenomenon found in a natural world affects the masses, both as a collective and individual experience. The individual response is closely linked to subjective interpretation of the natural world. Olafur Eliasson explains his fascination with weather, "The subject of the weather covers a whole spectrum from sheer profanity to high philosophy, from a high degree of complexity (in the case of chaos theory, for example) to the

mere fact of having to put on a raincoat to avoid getting sick with pneumonia. I would like to see *The Weather Project* at the Tate as raising a host of questions about how we see and experience ourselves and our institutions as such: about what art is in a museum, what a museum is in a city, what a city is in a country. I needed a very simple idea to establish a platform on which all these questions could be raised, and the weather provided it. In Latin, the weather is called tempo, which also means time, and time of course is a key factor in experience more generally. I also thought the weather would be very crucial and relevant to an art museum.”<sup>30</sup>



Figure 12: Olafur Eliasson, *The Weather Project*, 2003

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<sup>30</sup> Everett et al., *BOMB Issue 88, Summer 2004 (BOMB Magazine)*.

Another artist working with fog is Fujiko Nakaya who started in 1970 creating installations inspired by ancient Eastern pictorial traditions where fog and clouds play a prominent role in both the composition and the significance of the image. Nakaya in collaboration with engineer Thomas Mee have developed techniques for generating water-based artificial fog to protect orchards from frost. Fuyiko uses dense fog to cover outside spaces such as bridges, parks, rooftops, etc. She treats fog as an interactive media that is in dialogue with nature and depends on wind conditions, temperature and relative humidity in the environment.



Figure 13: Fuyiko Nakaya, *Cloud*, 2012

Minimalist Robert Morris also experimented with the use of ephemeral materials including heavy felt, mirrors, textile waste products, steam and dirt to dematerialize the object, as part of early Land Art works of 1960s. In his *Untitled (steam)* he poured damp air into the grass field, which could be appreciated only for a brief moment before the steam disappeared.

More recently, in 1997, Ann Veronica Janssens presented an installation art piece MUHKA, Anvers that employs light in an environment flooded by mist inside which the spectators navigate through different colored areas produced by electric lights. It is a system that was reincarnated in 2002 by Diller Scofidio + Renfro who built the Blur Pavillion for the Swiss Expo on Lake Neuchatel. The lightweight architectural structure 300 feet wide, 200 feet deep, and 75 feet high was suspended and covered in a perpetual fog. The primary building material was water pumped from the lake, filtered, and shot into the air as a fine mist through 31,500 high-pressure mist nozzles. A smart weather system read the shifting climactic conditions of temperature, humidity, wind speed and direction, and processed the data in a central computer that regulated water pressure.



Figure 14: Diller Scofidio + Renfro, Blur Pavillion, 2002

In England, the sculptor Antony Gormley in 2009 created an installation piece *Blind Light*, a large cubicle made from transparent glass inside filled with a thick white fog. Another architect creating ephemeral environments, Tetsuo Kond, in 2010 collaborated with an environmental engineering firm, Transsolar, to create an installation, which consists of a suspended cloud called *Cloudscapes*. The system pumps three layers of air into the space: cold

dry air at the bottom, hot humid air in the middle and hot dry air at the top that produces an encompassing mass of condensed water vapor floating in the atmosphere that can be experienced on the ground and on the high helical ramp erected in the center of the room.

The role of fog in many of these works is to spatialize light and at times an image. Borrowing various forms of mediums and integrating them with the space of the artwork to create a poetic multisensory experience of the space, is in the trajectory of installation art. My work *Horizon is an Imaginary Line* is a continuation of this course.

### Methodology

#### **Space**

The last 50 years of art have been marked by the meaningful treatment and inclusion of space that artwork inhabits into the experience of that artwork. Contemporary installation art have radically pushed the boundaries of what is accepted as an exhibiting space and actively incorporates space in which the art is situated.

*Horizon is an Imaginary Line* occupies the stage of Jones Playhouse Theatre at University of Washington, Seattle. Originally Jones Playhouse Theatre was a storehouse that was remodeled into a theatre in 1930, the Floyd and Delores Jones Playhouse (originally called the Seattle Repertory Playhouse). It was the very first state-sponsored theatre in the nation and was home to Works Progress Administration (WPA) projects and the Negro Federal Theatre Projects. The Playhouse Theater was renovated in 1968 and 2009, and assigned to the School of Drama at University of Washington. Today it is a one-story brick building, with a small partial basement totaling 12,940 gross square feet and seating for 210 in an ancient Greek theater style. The stage is semi-circular and surrounded by terraced seating.

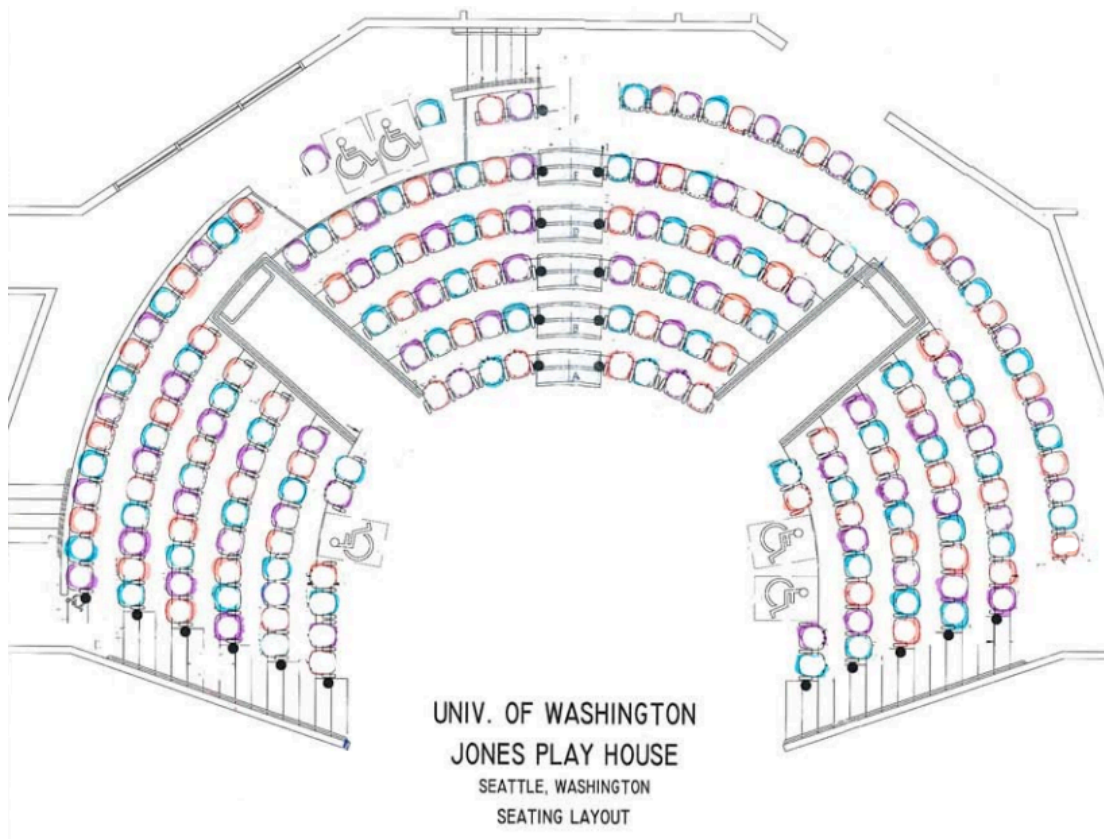


Figure 15: Jones Playhouse Theatre space

At the beginning of the exhibit viewing, the doors of Jones Playhouse Theatre open for visitors to enter directly the stage where the installation takes place. Visitors are encouraged to explore the entire stage and the installation in it at their own choosing. The seating is covered with black fabric and the floor is painted with Rosco Supersaturated Concentrated Velour Black paint to transform the space into a large, darkened semicircular room. Without light, the space cannot be defined and creates a disorienting sensation for visitors. Once each visitor's eyes have adapted to the dark, his/her attention is grabbed by the tiniest amounts of light that are composed to cover the stage of the theatre.



Figure 16: Spatial setup for the *Horizon is an Imaginary Line*



Figure 17: Spatial setup for the *Horizon is an Imaginary Line*



Figure 18: Jones Playhouse Theatre space

The following technology is arranged across the space:

- 2 Barco DML1200 moving digital luminaires
- 2 Panasonic PT-DW6300US movie projectors
- Unique 2.1 hazer
- DF-50 Diffusion hazer
- FQ-100 fog machine
- ION lighting console
- GrassHopper Hippotizer media server
- Axion media server
- Zookeeper control software
- 8 Meyer full-range speakers
- 2 Meyer subs
- Fireface 800
- 3 audio crossovers

## Projection

Projection technology is the key medium in the *Horizon is an Imaginary Line* that allows for the re-appropriation of the projected image into spatialized light. Projectors: 2 Barco DML1200 moving digital luminaires and 2 Panasonic PT-DW6300US movie projectors are controlled by ETC ION lighting console controls. The media is stored and commands sent from ETC ION are processed through the GrassHopper media server for the Panasonic projectors and AXON media server for the Barco projectors. Both of these processing engines provide multilayered real-time video playback and manipulation. The GrassHopper communicates with the Hippo network, while the Barcos use Art-Net protocol for transmitting the lighting control protocol DMX512-A over the User Datagram Protocol of the Internet Protocol suite. The GrasHopper is supplemented with the ZooKeeper interface that provides timeline edits of videos.

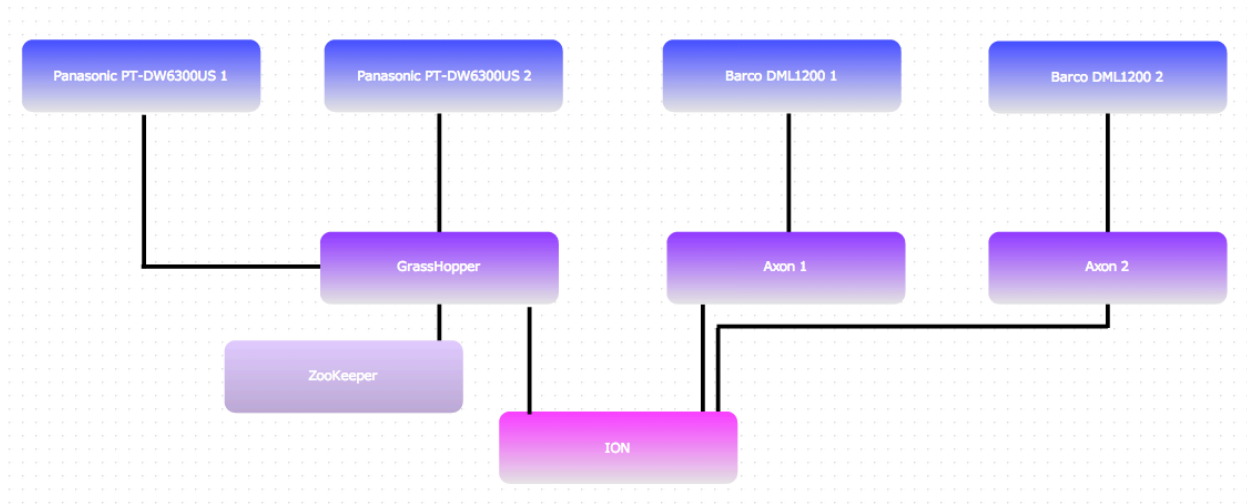


Figure 19: Projection system diagram for *Horizon is an Imaginary Line*

Using projections as a light source has also been the subject of Professor Geoff Korf's research at University of Washington's School of Drama. The title of his practice-based researches is *A New Methodology for Theatrical Lighting Design using Digital Projectors*.

Professor Korf describes it in following words:

For more than one hundred years, the lighting of live performances has relied upon incandescent sources. The development of lighting design has largely been focused on controlling how to focus attention to the performers, while technological development has tended towards increasing the efficiency and versatility of lighting instruments. A modern lighting designer has at his or her disposal a wide range of fixtures that can project tightly controlled beams of light from great distances with great intensity. Some of these fixtures are even capable of changing their color, beam shape or focus by remote control.

Following technological developments in theatrical lighting fixtures, there have been significant developments in digital projection systems. Most significant to this proposal has been the development of digital projectors that are both bright enough to rival conventional theatrical fixtures and reasonably affordable. I believe this development, along with the current trend towards more efficient (greener) technology point to a potential revolution in designing lighting for live performance.

The aim of this proposal is to develop, practice, and share new methodologies in lighting live performers using projectors as the primary light sources.

My research concentrates on digital projection as a light source that in interaction with fog in the air creates the sensation of light being palpable. I started my research by projecting a simple white outline of a black circle on a black background onto the brown wooden floor in a darkened space. While experimenting, I observed that the only visible light on the ground was the white outline, flat pixelated light. Although the image of the white outline was opaque, the projection of it did not seem opaque on the ground. It appeared as a transparent white light in a sharp shape that is lighting the space. Due to the pixelization of the image, slightly red net covered the image. The very edge of the image was tinted by soft yellow and red color, and inside edge was a dark red glow. The source of light is a bright 6000-lumen lamp, and the light around the lamp was so bright that it produced perceptual sensation of a halo; colored and white arcs around the lamp are produced as a result of light interacting with dust and other matter on the lenses and in the air. The halo was visible only when looking into the source directly. When a person moved in front of the source of light, large and strong black shadows were formed.

The experience of projection can be manipulated by positions of the projectors. Each of Panasonic PT-DW6300US projectors was positioned on one sidewall of the theatre, together they produce one connected or separate images by emitting horizontal beams of light. One Barco DML1200 is positioned above the center of the stage and the other is at the center top of audience terrace. Both of those are moving digital luminaires and their yokes were programmed to move during the piece and in so emitted different directions of light beams.

My research of re-appropriating the use of projection mostly depended on its interaction with homogeneous clouds suspended in the air that makes light beams visible and creates subtle diffusions of light.

### **Haze and Fog**

*Horizon is an Imaginary Line* utilizes Unique 2.1 and DF-50 Diffusion hazers throughout the installation piece and FQ-100 fog machine during one sequence of the piece. Fabrication of fog and haze that is usually known as a weather phenomenon is used to imply a natural realm that provokes awe and wonder. From antiquity, the optical phenomena held a fundamental role in both inspiring and examining premises about the physical world.

In a treatise, *Meteorologica*, from around 350 BC, Aristotle wrote about the earth sciences including definitions of water evaporation, weather phenomena, and earthquakes. Nevertheless, most of the weather phenomena were long considered to be signs from God until decoded by scientist in 16<sup>th</sup> century. The weather has been employed in science, atmospheric optics, astronomy, art, art history, color theory, mythology, and military throughout history. Entire civilizations have been ruined or have prospered depending on their ability to predict and adapt to climate change.



Figure 20: Camille Flammarion, *The Atmosphere: Popular Meteorology*, 1888

In my early observations of the projected white outline of the black circle, I also tested the interaction of light with haze. In that experiment, the haze machine was positioned on the floor in the center of the space, and it was turned on for 2 minutes to evenly and moderately cover the entire room with haze. Hazers use compressed gas to force the fluid through a very fine nozzle, which breaks the fluid down into very fine particles. Those particles are then sent through a heated evaporation chamber and a fan is used to blow the particles directly into the air. What comes out is a very fine haze or a cloud of white 'smoke' which has particle sizes in the 5 to 10 micron range. Since the particles are small to start with, it takes much longer for the larger clumps to reach critical mass and fall to the floor. As the haze started to fill the stage, the

projection fell on the haze, an unobtrusive and homogeneous clouds suspended in the air. The fine haze spread evenly making the light beams highly visible.

The haze moved up in the air fairly fast and as it went up, all the light in the room fell on the haze and revealed the shape of light and the direction of light rays. It made light visible, volumetric, and sculptural. The haze, the translucent collection of particles, kept on moving in a smoky manner towards the ceiling. As the haze continued to move around the dark room, it was only visible where there was light and the light rays were only visible where there was haze.

The haze revealed the path of light from projector to the ground where it projected the shape of an outline of a circle and disclosed the physical movement of light moving in a straight line from a projector to the ground in a shape of an "o." As such, the haze revealed a perfect cone of white light. I perceived the foggy translucent cone as an enclosed space within the space of a stage. I entered it and resided within the cone of light. The cone was bright with sharp edges and it diminished the presence of the projection on the floor. I played the video of that same projected circle becoming a square over the course of 10 seconds. In that time the cone precisely transformed into a cube of light, and then again morphed back into a circle. As the time passed, 5 minutes since the hazer was on, the haze dispersed across the space and the light became less visible on the ground but it was still swirling towards the source. Over time the brightness of the light on the haze became much softer. After 5 more minutes, the haze has disappeared and the projection was only visible on the ground.

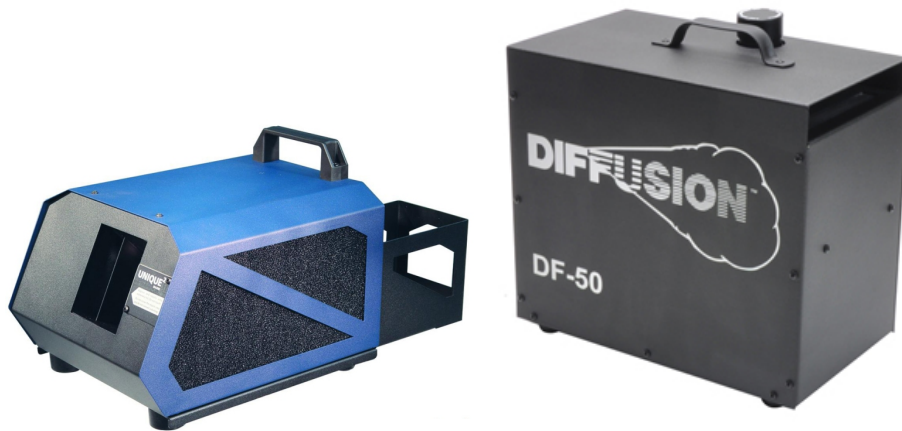


Figure 21: Hazers used in the *Horizon is an Imaginary Line*

The fog is different from haze in so that it is much more dense and opaque, it is more localized and disperses much quicker. The haze is present and maintained throughout the *Horizon is an Imaginary Line* piece, and then fog is introduced in the middle of the piece covering the staircase while there is a projection on it. Jessica Jones, the technical assistant, built a custom-made fog chiller that delays dispersion of the fog and maintains it close to the surface for extended period of time. In so, the projection hits the fog that is covering the surface of the stairs.



Figure 22: Fogger and fog chiller used in the *Horizon is an Imaginary Line*

## Animation

The design of animations is crucial in shaping the kinetic behavior of projection in haze and fog. The shape, form and progression of the projection generates the fluidity of light being sculpted in space. After series of experiments with various projections, I concluded that utilizing simple geometric forms slowly transforming in time are the most effective in creating fields of light that implies natural realms for visitors to inhabit.

The animations were created by use of the Adobe AfterEffects editing software and manipulated in real-time by the Hippotizer media server. These tools provided creation, animation, and compositing of abstract animation through key-framing, time-remapping, animation, dynamic effects, color-correction, computer based lighting, 3D camera construction, adjustable angle of observation, etc. All animations are produced in a layered and non-linearly editing environment of the Adobe AfterEffects and imported into Hippotizer that produces a single output of full HD fed from 8 real-time media layers.



Figure 23: Animation layout in ZooKeeper software for *Horizon is an Imaginary Line*

Complex compositing of abstract moving imagery interacts with haze and fog and results into dynamic environment of light. The following image is a screenshot from the animation and photos below show the animation being projected in the space filled with fog.

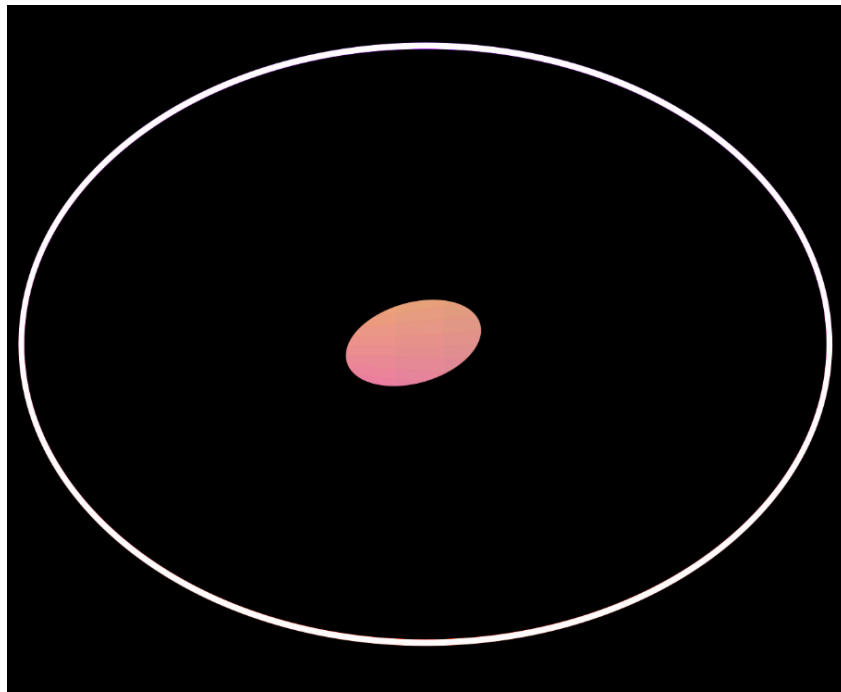


Figure 24: Animation screenshot for *Horizon is an Imaginary Line*

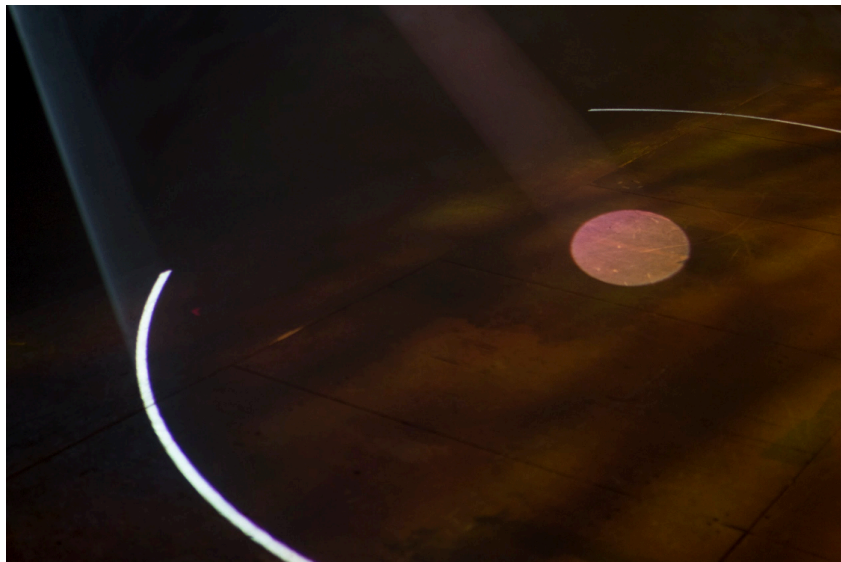


Figure 25: Maja Petric, *Horizon is an Imaginary Line*, 2013

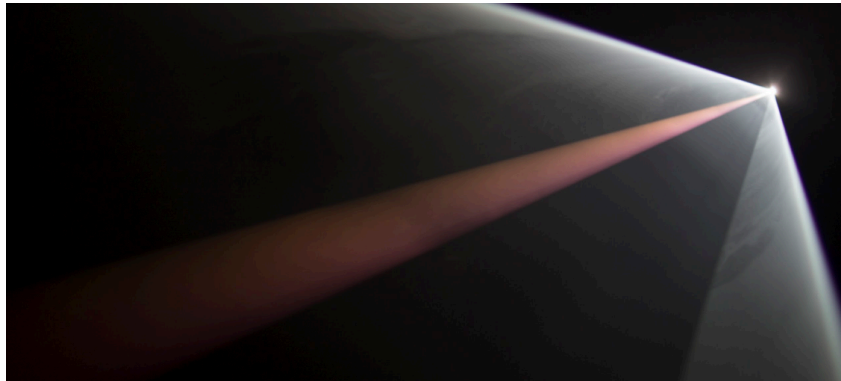


Figure 26: Maja Petric, *Horizon is an Imaginary Line*, 2013

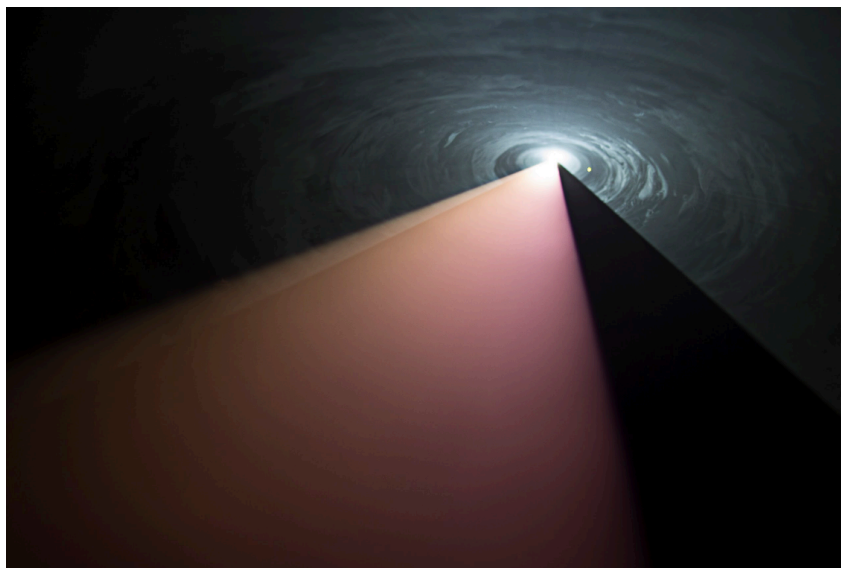


Figure 27: Maja Petric, *Horizon is an Imaginary Line*, 2013

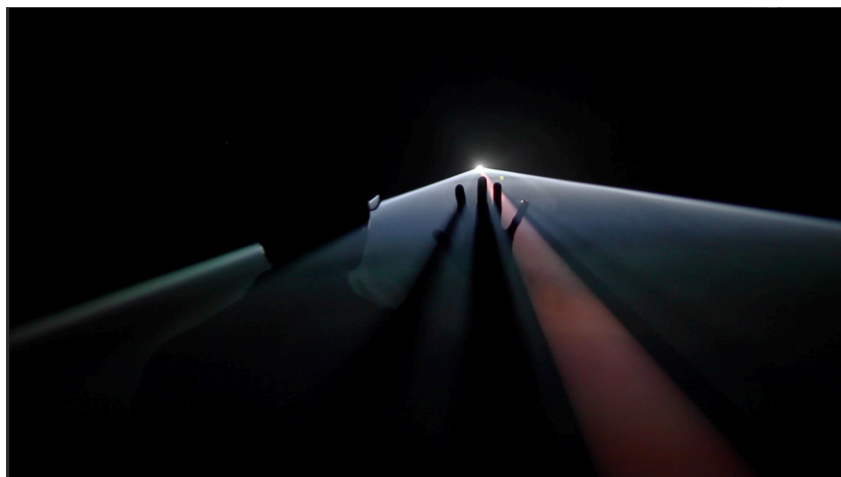


Figure 28: Maja Petric, *Horizon is an Imaginary Line*, 2013



Figure 29: Maja Petric, *Horizon is an Imaginary Line*, 2013

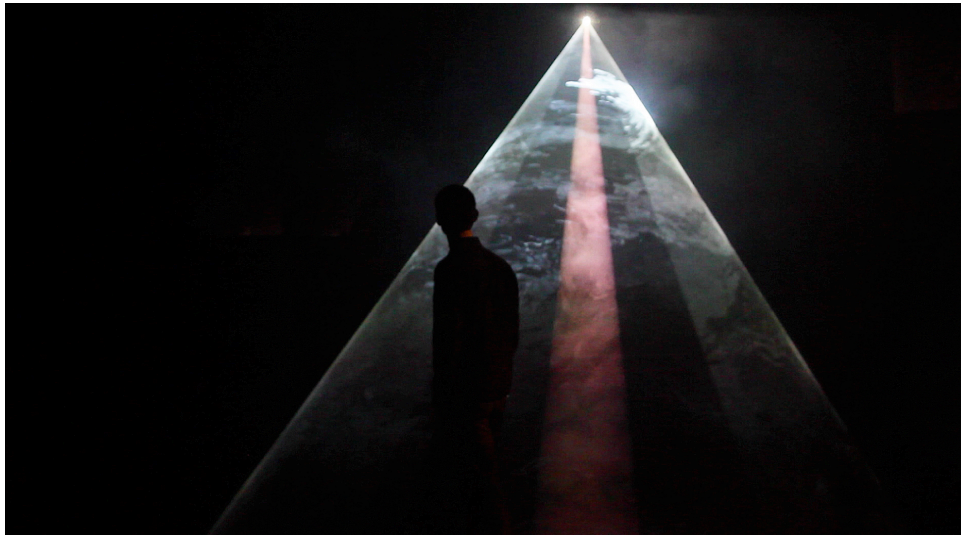


Figure 30: Maja Petric, *Horizon is an Imaginary Line*, 2013

The aesthetic of simple shapes, bold colors, and dynamic geometric have a heritage in color field painting and abstract expressionism. They combined the anti-figurative aesthetic of

the European abstract styles such as Futurism, the Bauhaus and Synthetic Cubism with the emotional potency of German expressionists. Mark Rothko is among the representatives of the color field movement that include Helen Frankenthaler, Al Held, Barnett Newman, Kenneth Noland, Frank Stella and others. Rothko saw the work of modernists being influenced by primitive art that he compared to that of children, "child art transforms itself into primitivism, which is only the child producing a mimicry of himself." Rothko's "primitives" were fields of color in his aquarelles that evoke landscape scenes.



Figure 31: Kenneth Noland, *Beginning*, 1958

Abstract geometry was also a vehicle of early computer animation. John Whitney Sr. is considered a pioneer of modern motion graphics. Beginning in the 1960s, he created a series of abstract animation that used computers to create a harmony of motion that was complementary to sound and music. The look and feel of his work relied on color and line to create a composition, which exists with a degree of independence from visual references in the world.



Figure 32: John Whitney Sr., *Matrix III*, 1972

The following is a screenshot from the animation that is linked to the heritage of color field painting and underneath it is a photo of it being projected onto the fog.

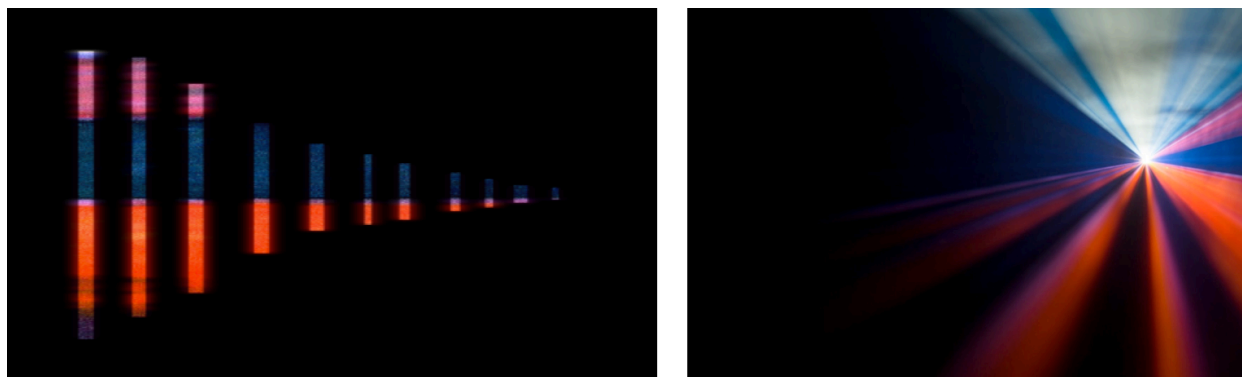


Figure 33: Animation screenshot for the *Horizon is an Imaginary Line* and projection of that animation onto the haze, 2013

### Sound

The connections between the visual arts and experimental music became tight in the 1960s and 1970s when sound and image were combined in installation artworks. Eastern European artists and composers were at the forefront of these new experiments with sound including pioneers of electronic music like Milan Grygar, Milan Knižák, Krzysztof Penderecki, Szabolcs Esztényi, Krzysztof Wodiczko, and others for who the process of creating the image was both a performance and the creation of a new piece of music. The sound created for the *Horizon is an Imaginary Line* responds to those tendencies and integrates them with the contemporary trajectory of electroacoustic spatial sound in tradition of artists such as Andres Bosshard, Paul DeMarinis, Rolf Julius, Richard Karpen, Christina Kubisch, Bernhard Leitner, Francisco Lopez, Andreas Oldorp, Ed Osborn, Juan Pampin, Martin Riches, Steve Roden, Erwin Stache and Miki Yui. The same as visual installation artists, these artists work in field of integrating space as the compositional element of the sound piece. They utilize technological means to create sound that reaches listeners from all directions and in so improves the realism of the perceived sound by providing information from all directions, not just from in front of the

listener. Spatialisation of sound is more specifically connected with electroacoustic music to represent the projection, localization and movement of sound sources in space.

The sound composition process for the *Horizon is an Imaginary Line* began with collaborative conversations with sound artist Daniel Peterson<sup>31</sup>. Daniel Peterson uses:

- 8 Meyer full-range speakers
- 2 Meyer subs, one Fireface 800
- 3 crossovers

Our intent was to create an electroacoustic counterpoint to the experience of light that enhances the ambience of space by appearing at the threshold of perception and then morphing over time. Composer Daniel Peterson describes the sound production process:

*Horizon is an imaginary line* attempts to create real and imagined spaces using light and suspended haze. I began creating sonic landscapes using streams, waves, birds, crickets, rain and thunder to complement these spaces. Soon I realized that using these sounds gesturally would overwhelm the subtlety and tranquility of the light suspended in haze; the lines and shapes created by the light are thin and somewhat stationary creating a sense of being suspended in time and space.

Working closely with Maja, I decided that using textures with minimal gestures would enhance these suspended states while also helping to push time forward slowly. Following Maja's aesthetic of utilizing the space of the theater itself I recorded sounds around the theater including the hum of the electrical equipment, the projectors, the ventilation system, the hazer and fogger, the movement of the Barco projector and the theater light control board. Using these sounds along with the sounds of landscapes give a contrast between sounds of the physical space of the theater and of the spaces that are imagined and remembered through association and also transform the theater into a canvas itself.

Maja's light art is interesting because what you are seeing is light bouncing off tiny particles of water floating in the air surrounding you. I was immediately reminded of granular synthesis in which many small grains (or particles) of sound are synthesized and added together to create a mass of sound. So I began to break down the sound recordings

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<sup>31</sup> Daniel Peterson was born and raised in Honolulu, Hawaii. He recently completed a Master of Music in Composition at the University of Washington under Juan Pampin. He has had works shown at the International Computer Music Conference in Montreal and New York, Art Basel in Miami, Henry Art Gallery and Meany Hall in Seattle, and most recently at the Reykjavik Art Museum in Reykjavik, Iceland. His interests include spectral analysis, ambisonics and the exploration of the relationships between literature, philosophy and music.

I collected into grains and then synthesized textures with them using filters and delays. Using surround speakers I then place the grains all around, floating like the haze. Using these grains allows the textures to be suspended for as long or as short as needed based on the motion and transformation of the light.

Working with Michael McCrea, I chose a hybrid speaker setup, combining ambisonics, point source speakers and general diffusion. On the stage level, there are four speakers surrounding the space using ambisonics to spread the sound out and fill up the main area. Above each projector to the left and right of the stage are two more speakers to help give height to the soundscape as well as giving a kind of 'super' stereo that can be used for decorrelation. The final two speakers are placed at the front and back of the theater and pointed away from the stage up into the rafters. These speakers will further help with the height of the soundscape and will diffuse sound into the rafters. Using this speaker system with carefully placed sounds will open up the defined spaces created by the light.

Much like the light experience in the *Horizon is an Imaginary Line* derives from the cinematic re-appropriation, sound is undergoing similar process that Richard Karepen and his contemporaries call “aural cinema”. Karpen employs such technique in his *Life Study* compositions that through non-linear narrative shifts from synthetic to natural sounds and in so points at the ambiguous meaning that unfolds over time.

### **Installation**

Final integration and placement of projection, haze, fog, and sound in space was a result of experimenting with relationship and balance of all the parts. The layout of the space was as in the following blueprint.

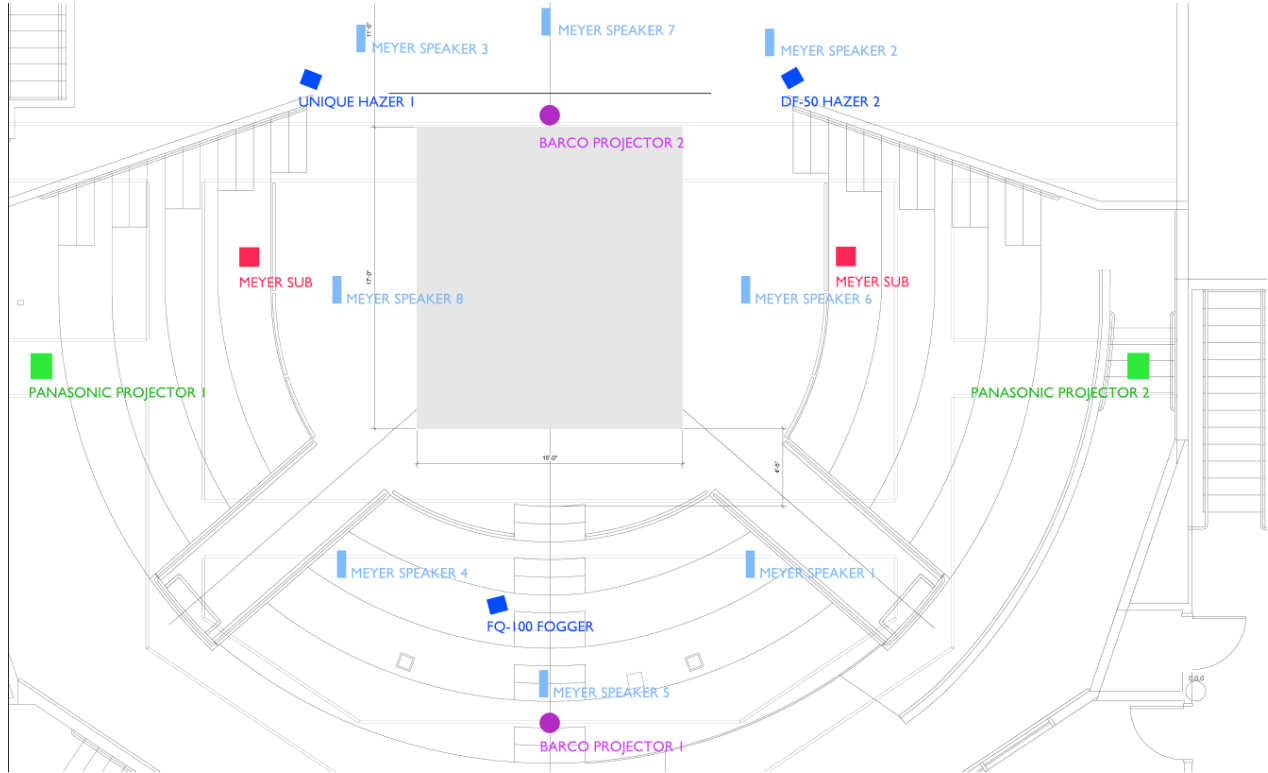


Figure 34: Equipment Layout for the *Horizon is an Imaginary Line*

Progression of multisensory experience is outlined in the following projection and sound cue sheets.

HORIZON IS AN IMAGINARY LINE						KEY	
Cue List	July 7th, 2013					Chanel number	instrument controlled
CUE	ACTION	duration	primary ch	follow time	show timeline		
300	pre haze	3:30	51,52	2:00		51	unique haze machine
300.5	fog		50	0:10		52	df haze machine
301	fog out		50	1:20	0	50	fog machine
305	Circles in	3:45	11,12	2:02	2:02	30	barco projector
305.5	reposition		11,12	54	2:56	40	barco projector
305.6			11,12	37	3:33	11,12,13,14	Panasonic projector layers
306	haze effects start		51,52	0	3:33		
310	Circles Yellow		14,-(11,12)	59	4:32		
310.5	add layer		13	1:05	5:37		
315	Circles Yellow Squares		11,12,-(13,14)	1:36	7:13		
320	Squares		11,12	1:25	8:38		
320.5	layer out		-(12)	0:07	8:45		
325	Rain		14	0:05	8:50		
325.1	Squares out		-11	0:10	9:00		
325.3	waterfall in, Rain speed		31,40,14	0:10	9:10		
325.5				0:10	9:20		
325.8	speed		31	1:30	10:50		
325.9	waterfall out		31	0:10	11:00		
326	Rain effect		14	0:02	11:02		
327	sun preset		30	0:05	11:07		
328	sun		21,-(14)	1:00	12:07		
330	Open GL		11	0:05	12:12		
340	sun move (seats)		30	0:30	12:42		
340.1	Clouds Sky position		12	0:00			
340.5	Clouds Sky	7:09	12	0:00			
341				0:30	13:12		
341.5				0:15			
342	(*10 animation ends)			0:00			
342.4				0:00			
342.5	Rothko in Open GL out		13,14	0:54	14:21		
343	sun at ceiling			0:40	15:01		
344	Shape Space	3:30	15,16	0:00			
345				0:10	15:11		
361				0:45	15:56		
362	fade sun		30	1:45	15:46		
362.5				0:00	17:31		
363	preset barco sky		30	0:01	17:32		
364	barco sky			0:20	17:52		
364.3	Shape Space out			0:15	18:05		
366	sky out			0:15	18:18		
367				0:20	18:38		
368	barco sky point		30	0:03	18:41		
369	barco sky out	0:15	21		18:56		

Figure 35: Projection cue sheet the *Horizon is an Imaginary Line* (this will be replaced with refined sheet)

SOUND	start time
theater room noise (slowly filtered)	0:00
bulldozer (low pass filtered)	3:30
cicada (granular synthesis)	3:50
chop saw (high pass filtered)	3:50
fog machine (granular synthesis, extended, unprocessed)	5:20
theater duct noise (granular synthesis, filtered)	5:50
rain (unprocessed)	8:40
maunawili falls stream (unprocessed)	8:40
thunder (low pass filtered)	10:40
pihea ridge birds (granular synthesis, extended, multiplied layers)	12:00
bellevue birds (granular synthesis, extended, multiplied layers)	11:20
badlands (unprocessed, extended)	12:00
theater light equipment noise (granular synthesis, filtered)	12:30
hazer (granular synthesis, filtered)	14:10
brenecke beach waves (filtered)	15:30
bell 2 (granular synthesis, extended)	15:50
bell (granular synthesis)	17:45

Figure 36: Sound cue sheet for the *Horizon is an Imaginary Line*

Projection cues are being run from the ION lighting control console.

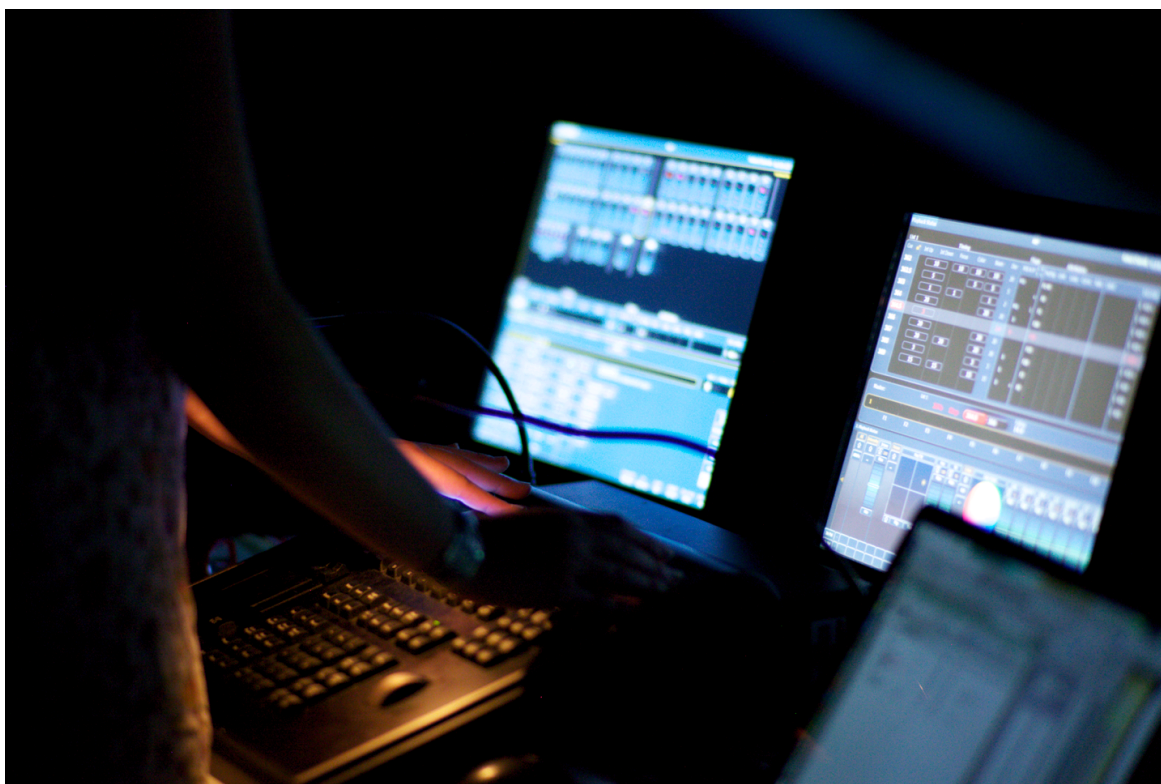


Figure 37: ION lighting control console. running cues in the *Horizon is an Imaginary Line*

## Experience

In nature nothing is created, nothing is lost, everything is transformed.

Jean Renoir, *Jean Renoir: Interviews*, 2005<sup>32</sup>

We (the indivisible divinity that works in us) have dreamed the world. We have dreamed it resistant, mysterious, visible, ubiquitous in space and firm in time, but we have allowed slight, and eternal, bits of the irrational to form part of its architecture so as to know that it is false.

Jorge Luis Borges, *Avatars of the Tortoise*, 1964<sup>33</sup>

The Horizon is an Imaginary Line is a multisensory experience, balanced interaction of the body and the space with light, color, image and sound that inhabits it. The space of Playhouse Jones Theatre is transformed into an environment without defined boundaries that provokes heighten perception, awareness of undefined space and one's own presence in space without direction.



Figure 38: Maja Petric, *Horizon is an Imaginary Line*, 2013

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<sup>32</sup> Cardullo, *Jean Renoir*.

<sup>33</sup> Borges, *Labyrinths*.



Figure 39: Maja Petric, *Horizon is an Imaginary Line*, 2013



Figure 40: Maja Petric, *Horizon is an Imaginary Line*, 2013

Moving beams of light are simultaneously physical and ephemeral, figurative and abstract, still and dynamic. Phenomenal experience of light and sound is nearly impossible to capture as they change based on the state of the fog and viewers position. Each visitor creates a silhouette in space that contributes to the total sensation of the piece, and thereby integrates the visitor's presence into the aesthetic experience. As visitors move, their figures block the haze and fog and the moving images, which provide them with an opportunity to interact with the environment and make an immediate influence on it. The play of light across the space that visitors enter also transforms perception of bodies present in the piece.



Figure 41: Maja Petric, *Horizon is an Imaginary Line*, 2013

Haze and fog are also interactive mediums that change their state based on flow of air in the space that is affected by the ventilation and open doors. It is impossible to perfectly control the state of haze and fog due to its high degree of temporal and spatial variability. In the piece,

the haze and fog have been moderately controlled by positioning the machines, adjusting intensity and frequency of ejecting it in order to contain suspended clouds in the space. The uncontrollable aspect of the fog and haze add organic quality to the experience of light and image that cannot be contained due to its ever-changing state over time.

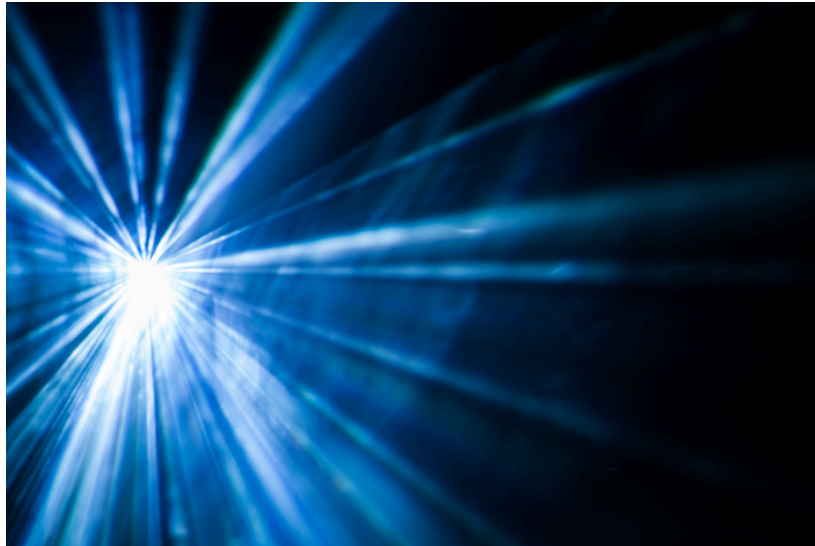


Figure 42: Maja Petric, *Horizon is an Imaginary Line*, 2013



Figure 43: Maja Petric, *Horizon is an Imaginary Line*, 2013

Both image and sound are also composed to be elusive and on a borderline of the visual and auditory threshold. They appear in abstract forms and morph into organic recognizable elements from nature, only to be processed again and filtered to its abstract parts. Such is the nonlinear dramatic arc of the piece that can be felt, seen, heard, smelled and touched, which leads to a discovery of a natural environment and ones relation towards it.



Figure 44: Maja Petric, *Horizon is an Imaginary Line*, 2013

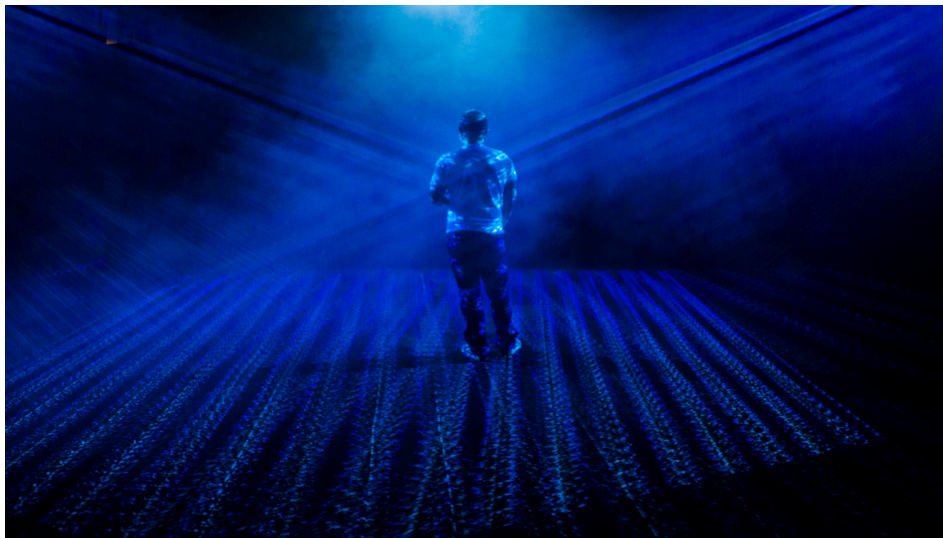


Figure 45: Maja Petric, *Horizon is an Imaginary Line*, 2013

The least elusive part of the piece is projection of the animation that can be noticed on the floor. It is the material that with haze and fog provides sculpting of light over time, and it is experienced as a side effect of spaces shaped by light that visitors tend to tune out while focusing on light interacting with haze and fog. Flat digital imagery on the floor remains as an evidence of light being materialized by use of digital information.

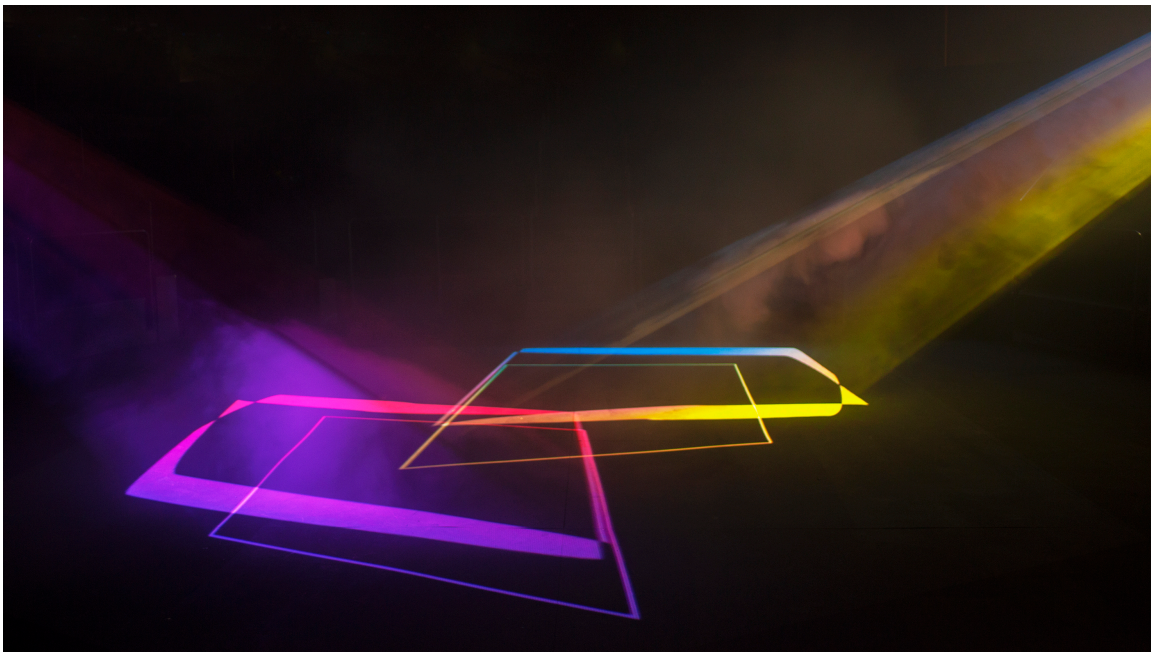


Figure 46: Maja Petric, *Horizon is an Imaginary Line*, 2013

### Innovation

The era of modern and postmodern art has been marked by synthesizing different mediums into hybrid multisensory spaces. The works mentioned previously provide a wide methodological context with specific references to works of artists that re-appropriate cinema and some that spatialize light. The *Horizon is an Imaginary Line* looks to take further the approach of re-appropriating usage of a moving image into an experience of spatial light by creating a nonlinear composition of light and sound that could be experienced in space as an

extension of the that space that is ever-changing. The piece innovates ways of materializing the sensation of light by use of multichannel mixing and playback projection technology.

Transforming the poetic experience of space by use of dynamic architecture of fog, light and sound has exciting potential for further practice-based research. In my future work I plan to experiment with the following:

- site-specific installation for various locations such as tunnels where light and image can appear extruded from the oval shape of the space while moving from the far-reaching end ascending towards visitors
- complex layouts and in a controlled setting such as a gallery space which can accommodate multiple projectors and speakers to be built into the walls at various positions for seamless ambisonic and “ambilumia” setups.
- erasing projected image by use of mirrors that reflect the image before it hits the surface
- engineering responsive mechanism by use of motion tracking system that detects visitor’s movement in space and accordingly activates projection around them in shape of their silhouette
- engineering low frequency speakers to move haze and fog within the space
- algorithmic synchronization of light and sound
- programming low velocity fans and cooling system

## Appendix

Please see <http://www.majapetric.com/portfolio/horizon/> for more information about the

*Horizon is an Imaginary Line.*

## Vita

Maja Petric was born in Zagreb, Croatia. She holds a Masters degree in new media art from New York University, Tisch School of the Arts, Interactive Telecommunications Program (ITP), and a Masters degree in journalism from University of Zagreb, Croatian Studies. She practices changing the perception of space by use of lighting materials in combination with audiovisual systems that engage perception, emotion, memory, and imagination. Maja's installations have been exhibited at Henry Art Gallery, Amazon Gallery and Microsoft Research Gallery in Seattle and awarded the Richard Kelly Light Art Award, two Thunen Lighting Awards, and the Doctoral Fellowship from Croatian Science Foundation.

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