Materializing Light

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MATERIALIZING LIGHT

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01 CONTENTION
Materializing light, Screenplay, Ruin, Transformation

02 PRECEDENT STUDY
Interaction, Experience

03 ULMITECURE
Exercises of architecture made of light, Light model, pepper’s ghost

04 SITE STUDY
Hiroshima Memorial

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Artificial Light, especially volumetric light can be materialized and transform the existing ruin. Specifically, I would choreograph the interaction between people and light to exaggerate, or dramatize the tragic feeling of Hiroshima Memorial Dome.
Revitalizing the Past

There are things that belong to the past. They contain treasurable memories but no longer fit in contemporary world. There are many ruin sites in major city centers as Tokyo, Rome or Beijing. They are isolated from contemporary urban life, and often being debated whether to preserve it as it is, or tear it down.

The thesis introduces light as a solution to revitalize the ruins while minimizing physical constructions. Artificial light, especially volumetric light can be materialized and transform the existing ruin. Since light is a material in between physical and virtual realm. It can be designed to revitalize the space, while minimizing physical constructions that might damage the historic site. Through revealing, hiding or introducing additional information, the designer can refurbish the past and present to the contemporary.

Light as a mask of transformation

On the left is a piece of Mark Rothko’s mural painting, the color was faded 50 years after commission, and adjusted with projecting an additional layer

On the right is a 3d version of Rotheko’s mural. It’s the Tribute in Light Installation in remembrance of 911 attack.

Inspired by both approaches, the thesis aims to not only restore parts of Hiroshima Dome’s appearance, but also introduces experiences of laughter and playfulness to lessen the tragedy.
1. The experience of light can be categorized as perception, movement, and interaction.

2. Light can be used as materials to create forms. It can paint a composition on existing walls.

3. In terms of movement, artists UVA has created the installation call momentum, which is an array of pendulums swing back and forth and allows people experience the rhythm and time.

What I find the most interesting is the direct interaction between people and light, as this is what distinguishes light from other materials.

1. Light at eye level dispels people from certain area, while the soft light can be inviting;

2. A wall made of light can be walked through, but it can channel the flow of people;

3. Mirror effect: strong light projects the silhouettes of human shadows on the wall, creates a stage of people and provokes self-awareness.
Point
- Indicates a position in space. Points could become a field condition.
- Associated light sources: LED light.

Dune
DUNE is a public interactive landscape that interacts with human behaviour. The table of nature and technology is consumed of large amounts of light that brighten according to the sounds and rhythms of passing visitors.

Evolving through several iterations, DUNE 4.1 enhances social interaction in the public pedestrian Maastricht, commissioned by Rotterdam City of Architecture. The 60-meter DUNE 4.2 is centered on the urban floor in Rotterdam. It uses less than 60 watts of energy. Within this setting, Rotterdam citizens can enjoy their walk of light. DUNE is an interactive landscape of light placed in the dark. Design studio on the occasion of the 10th Art Biennale of Sydney. With its hundreds of interactive lights and sounds, DUNE explores nature in a fantastic relation to urban space.

Specifications:
- 2006-2012 Modular system of light: 100 cm, width 60 cm, variable height: Variations of color, LED: sensory, speakers; interactive software and electronics, variable up to 400 meters.

Line
- A point extended becomes a line. With properties of length, direction and position.
- Associated light sources: flash, laser

Spazio permeabile
Below artist Dario Bernardini plays with light and space to create his impressive installations.

"My site-specific installations are based on triangular forms where lines pass through voids, floors, facades and even between buildings. Each installation is its own unique viewpoint, from which it can be seen as a two-dimensional form, following principles similar to architectural illusions."

Vanishing Point
"Vanishing point" explores perspectives on both local and visual aesthetics to re-shape, re-define and re-present an undefined area. The immersive installation by unified visual artist is executed using laser lights that beam light through space from an arbitrary vanishing point, resulting in the creation of different volumes, divisions and rooms, drawing on the sketches of Leonardo da Vinci. It offers an interactive space for the visitor to explore and around them.

The London studio continues their exploration of "light architecture", exemplifying the concept of perspective through the use of electric laser dots (LED) passing through the visitors. It is an immersive experience and an experience to walk through the concrete boundaries of space. You can experience the "Vanishing Point" at the entrance of the MAMA (Museum Voor Kunst en Architectuur) exhibition building, on the 27th of May 2013.

Materials: BGR laser, black, white, red

Line
- A point extended becomes a line. With properties of length, direction and position.

Your making things explicit
"I normally don’t think of the words as being about anything that is defined or explained. I think about each word as a sentence in a conversation. So I can both hear the actual sentence and the broader conversation. With the particular words, making things explicit, (2013) I was interested in using something that normally do not work. Normally, the idea is that the line is a location in the middle line. The only other way to achieve this is to take the piece from inside and put it outside, and have the glass box contain the spectator. So you are perfectly right when you say that you are becoming a part of the site when you stand in the light of the room.

To some extent, I’ve worked with these kinds of experiments for a long time now, but I still feel that I’ve only just started. Because then in it is to say that I can still improve. I can still make it more precise... the sentence."

Materials: MDF lamp, glass, paper, machine wood
**Plane** (Illuminated from below)
- A line extended becomes a plane. With properties of length and width, shape, surface and position.
- Associated light sources: LED light, often achieved through casting on real, sheets, smoke etc.

**Waterlicht**
WATERLICHT is a dream landscape about the power and poetry of water. As a virtual flood, it shows how high the water could reach without human intervention.

Innovation is a natural part of the DNA of the Dutch landscape through its anatomy and creative thinking. yet we are not born to have forgotten this. WATERLICHT is a powerful and poetic experience to remember.

WATERLICHT consists of many lines of light made with the latest LED technology, software and lenses. Originally created for the Dutch Delta Water Board (Rijkswaterstaat), the artwork has now travelled to the Museumplein in Amsterdam, the Field Museum in Chicago, France and Bologna, Italy. WATERLICHT will continue its journey to create more water awareness.

**Plane** (Illuminated from side)
- A line extended becomes a plane. With properties of length and width, shape, surface and position.
- Associated light sources: LED light, often achieved through casting on real, sheets, smoke etc.

**Line Describing a Cone**
Line Describing a Cone is made from a beam of white light emitted from a thin projective object positioned at one end of a darkened room. Passing through the projective is an articulated film of a line, which is shaped into a cone. The cone is reflected as a cone in the room, the reflected light causes the cone to be a beam of light that can be seen with a cone of light. The cone is a beam of light that can be seen with a cone of light. The cone is a beam of light that can be seen with a cone of light.

**Plane** (Illuminate from side)
- A line extended becomes a plane. With properties of length and width, shape, surface and position.
- Associated light sources: LED light, often achieved through casting on real, sheets, smoke etc.

**Corridor**
Two parallel cultures of water are in a completely dark, long room. They are made of drops of water, which fall from the ground. The culture of water forms a corridor, where the water is made of real water. The corridor can be made through the corridor across the industrial bathroom. The corridor is made of real water. The corridor is made of real water. The corridor is made of real water.

Materials: Metal, water, metal, hose, pump, 24 strobe lamps

**Beauty**
A structural hose sprays a curtain of fine rain from the ceiling of a darkened space. Through the hose is projected by a spotlight. From certain perspectives, a curtain can be seen in the falling water. It shifts into intensely or disappears as the viewer approaches or moves away.

Materials: Spotlight, water, curtain, hose, pump
Your chance encounter

Volume

- A plane extended becomes a volume, with properties of length, width and depth, form and shape, surface, orientation and position.

Mirror threshold

For John Wol, photography is a way to explore abstraction and the physical limits of image making. His conceptually driven photographic work is centred on ideas of visual perception and metaphysics, as in the "horizon" series, where he used an unprocessed film role as negative, creating vivid bands of color with a stark division between dark and light, or in other pieces altering uncovered surfaces to create light. More recently, he has begun exploring the human figure, in a series of black and white images that highlight negative spaces as intangible passage through corridors. In addition to photography, Wolf works in installation, creating abstract patterns in black and white, maps, dust, painted canvases, and projections on urban environments.

Atmosphere

- The light pervading in the space - stimulates form or mood of a place.

Feelings are facts

In this project, Eileen introduces condensed tanks of artificially produced fog into the gallery, stimulating with an artificial light spectrum, created using arrays of red, green and blue fluorescent lamps. The illusion in light is not something we feel in nature, however, as we walk through the space, the sight and sensations experienced become real.

Corner

- The space in the angle between converging lines or walls which meet in a point.

Corner Shallow Space

A Tunnel Corner Shallow Space is created in a corner, corner, the light creates an illusion of a three-dimensional object. Walking out of a small studio in the area of Venice, California in the early 1970s, Tunnell began his exploration with projected light, as seen in the documented video below. Setting up a slide projector mounted to the ceiling of the corner via a platform, Tunnell paradoxically experienced with conventional 20mm slide transparents off of opaque silver tape in various shapes registered to the geometry of the corner of the studio into generate what appears to be a three-dimensional volume of brilliant light.
Corner
- The space in the angle between converging lines or walls which meet in a point.

Corners, Barriers and Corridors
In terms of corner installations, a sequence of four related constructions – entitled 'Barrel Reflections' one four, 1977 – are on show for the first time since Ravilious' 1977 solo exhibition at the Dean Gallery, New York, as are an array of glowing wall-mounted discs that are camouflaged into a helix shape in the corner of the room. The work is an example of Ravilious' lesser-known, circular light fixtures – entitled 'to a man, George Mackay Brown 2 – born 1902.'

Mirror
- A reflective surface creates visual illusions of space.

Weather
In this installation, The Weather Project, representations of the sun and sky dominate the sequence of the Turbine Hall. A fox red permeates the space, an i-escape in from the environment outside. Throughout the day, the mist accumulates into mist, cloud-like formations, before disintegrating across the space. A glances overhead, a view of the red night sky, reveals that the ceiling of the Turbine Hall has disappeared, replaced by a reflection of the space below. At the far end of the hall is a giant semi-circular form made up of hundreds of microphone lamps. The air, repeated in the mirror overhead, produces a sense of startling silence driving the soil space with the reflection. Generally used in street lighting, microphone lamps emit light at a very narrow frequency that colours either blue or black and are invisible, thus transforming the visual hall around the sea into a vast auditory landscape.
Materials: Microphone fixtures, projection hall, bats, machines, mirror film, aluminium, and sandblasting.
There are four different types of light. The ambient light is considered as the most basic form of light. The second tier is projection, or surface treatment, including digital projections, shadow plays, silhouette shows, as well as gobos, which is a dark plate or screen used to shield the lens from light. Essentially projection enlarges designated information, but sometimes diminishes the presence of light itself. The third kind of light is volumetric light, which is also the primary focus of the thesis. Beginning with primitive shapes such as cone and extrusion, designers are able to create more complex geometries.

The last kind of light is animated light, which adds a fourth dimension to space and allows one form to morph into another. I attempt to animate the light through controlling the track of light sources, or controlling the size of cone shape through using oculus. When combining animated light with planar projections and volumetric light, unexpected coherences between mass and rays can be produced.
SHADES IN HIROSHIMA

Genbaku Dome was built in 1915 as an industrial promotion hall, and is the only building survived from atomic bomb. It locates at the northeast side of Hiroshima memorial park. It faces Ota river on its west. It locates in a commercial district and currently surrounded by tourism spots accompanied by restaurants.

The main entrance of the original building is from the west, but now it is protected by fence preventing damage from people.

The remaining structure includes one story wall on its west and east side, free-standing walls contains two cylinder spaces and rectangular volumes. The only part above head is the steel frame dome, and there’s no floor slabs remain. Reinforcing steel frames are inserted to support the structure from a typhoon or an earthquake

The opportunities I see from the site includes:
1. To reconstruct the front façade with light
2. The building is entered through underground channel to control circulation of people and reduce damages.
3. The open courtyard can be doing ground interventions and covered with mesh to receive light.
4. The path can be inserted through the window openings without touching it
The final design will be tested through

1. Models of both small scale and mock-ups to describe the experiences
2. Pepper's ghost device to collage the physical site model with phantom images.
LIGHT COLUMNS

TRACK OF SHADOWS

LIGHT CANPONY (PART)

LIGHT ROOFING
I’ve chosen to use screenplay as a tool to describe the sequence of interaction with light. Then the spatial experience can be combined in a sectional view. Design is developed through moving back and forth between the screenplay and the holistic section.
The Hiroshima Memorial Dome in the daytime is a ruin representing the tragedy of Hiroshima. After the sunset, there’s something different going on. The broken building seems to be recovered and you can see a new face made of light. The ground is surrounded by mirrors reflecting the city skyline. You are attracted by it and decided to visit.

However, you couldn’t find the entrance; it is surrounded with the mirror and you can find only the reflection of yourself in the mirror. When you are about to give up, you found an illuminated line on the ground.
Walking down the stairs, you reach the reception room. The room is filled with haze. There’s a light source buried in the floor projecting a cone to the mirror on the ceiling. The light reflects and form a mushroom-shape canopy. People all gather under the canopy waiting. You can roughly figure out the size of the room but you decide to get in the canopy as well because it makes you feel safe in space you can see.

After walking along the river for 3 minutes, you see stairs going down very bright.
Suddenly the canopy goes away, leaving everybody in complete darkness. And you feel the room is slightly shaking. Is it an earthquake? You are afraid. As you are complaining how unreliable light is, you hear a voice. Someone calls himself a guide and you are told this is a fallout shelter. What just happened was a bomb attack. "How absurd." You think.

"Follow me!" The guy opens a door at the back of the room. The strong light hit your eyes so bad and you think you will be blind.
Behind the door seems to be stairs going down. “You have to live underground in mineshaft until the radioactive elements go away. But don’t worry it won’t be long.”

You are still covering your eyes with hands. You realized the light is at your eye level. All you need to do is to bow and look down. You discover the stair is painted with mural of the dome.
Finally, you now stand on the ground. You are facing a wall. Behind you are people playing the courtyard and there’re shadows projected on the wall. You discover the gravestone at the bottom of the wall, reminding you how thin the line is between life and death.

“We decide to build with light,” the guide explains. “After the attack, they don’t trust any physical materials. Light doesn’t fall on your head. They replace walls with light to define space.” Now you understand why there’s light always at your eye level. As the ceiling becomes lower, you must crawl.
You walk around the building and there’re shades painted on the ground marking the corpses. You are terrified at first, until you discover the outline of a Pikachu. “I don’t like bombs at all. They killed my favorite cartoon character.”

Keeping walking and you are literally stand in the façade. There’s a path pierces through the building and you walk on the ramp.
The circulation ends at the scene of emergency staircase. It won’t be functional in a bomb attack, but it is certainly a good stage setting.

Now you are in the dome. The steel frames are coated with LED lighting. There’re core shape balloons floating in air look like a bomb falling.
YOUR CHANCE ENCOUNTER

Since light is such an ethereal substance that interact with the solids in a unique way, also because the movement of light adds the fourth dimension to the existing, animation appears to be the most appropriate tool that empowers the designers to investigate the complex behavior of light. The animation investigates the possibilities that light can be materialized and transform the physical ruin site.

URL for final video: https://youtu.be/l2sizpQ4fHAg
Walking down the stairs, you reach the reception room. The room is filled with haze. There's a spotlight buried in the floor. It projects a cone shape up to the mirror. The light rays reflect back to the floor and create a canopy. There are skylights at the side, producing a secondary screen. You want to step inside the canopy, walk around it, and touch the light.

The ground intervention traces the contour of building shadow from Aug 06, 1945, 8:16 am, when the bombing took place. The openings turn into recessed light buried in the ground. The shadow is represented using black gravel in contrast with soil.
HIROSHIMA SHADES

You now stand on the ground. You are facing a wall. Behind you are people playing the courtyard and there’re shadows projected on the wall. You discover the gravestone at the bottom of the wall, reminding you how thin the line is between life and death.
THE FIREWALL

At the north end of courtyard is the fire stair constructed against the concrete wall. Another layer of fin shape light is added outside of the stair. The fins gently move inward and outward as the concrete wall is breathing.

THE COURTYARD

The courtyard also covered with fog. Volumetric light creates various shapes and spaces. Coincidentally people gather under soft canopies while avoiding stronger light beams. There are trusses hanging spotlights above the head, creating light pavilions for people to rest and talk. There’s a light corridor against the wall formed by an array of light beams.
SHADES ON THE GROUND
Going up on the ramp, here again is a literal reference to Hiroshima shades. Each spot light is a tribute to a life. The transformation of light spots has the same pace of human breathing.

LIGHT FOREST
Walking toward the south of courtyard, there’s a balcony sticks out from the ruin and cone lights project from below. You can lie among the forest of light watching light spots changing their cone sizes.
In the dome are sky lanterns floating in the air, being dragged by strings on the ground. As the lanterns float against gravity, they strengthen the verticality of space. They also lighten the heaviness of the ruin and gives a sense of hope.
Instead of having the bracings cast dark shadows on the wall. They are dematerialized through replacing the shadows with white illuminated crosses.
THE BIRD-EYE VIEW

The ground intervention traces the contour of building shadow from Aug 06, 1945, 8:16 am, when the bombing took place. The openings turn into recessed light buried in the ground. The shadow is represented using black gravel in contrast with soil.