

Light through the Aufeis

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Introduction:

Created as an attempt to design the ineffable, Light through the Aufeis is an underwater light piece that is intended to create a meaningful dialogue between light and water in order to offer the opportunity for my audience to escape the everyday, mundane concerns of the 21st century. Recognizing in myself a tendency to get so caught up in the fast-paced world we live in, the focus of my thesis project has been to design something that is visually engaging to an extent that other people, who might share my dilemma, can experience a small moment

away from that tedium. After all, life is worth living, joy is worth experiencing, and small things are worth appreciating.

Inspiration:

Looking around for inspiration, I found particular pleasure in witnessing natural light phenomena. For instance, there are moments near dawn or dusk when sunlight travels through a longer expanse of atmosphere, which in turn allows for greater scattering of light off of airborne particles. If this enhanced scattering occurs with clouds positioned in front of the sun, relative to our positioning, something incredible happens. The clouds filter the sunlight and beautiful columns of light and darkness appear across the horizon. Technically known as Crepuscular Rays, this phenomenon truly captured my interest, and became the foundation of my light pursuits. At the same time, wishing to push the natural progression of my work forward, I made another decision regarding my light piece. My previous light piece, which drew formal inspiration from underwater creatures such as jellyfish, starfish, and octopi, had often elicited the question, “Can it go underwater?” Since that work had never been intended to exist underwater, I repeatedly had to say no. However, I grew increasingly enchanted with the notion of designing a light that interact-



Figure 1:
Stephanie Schutter
Light through the Aufeis 2013

ed with water, and therefore chose to challenge myself to make water a constraint for my piece. Bearing the constraint of water in mind, a reexamination of Crepuscular Rays led to a discovery of their potential to exist in an underwater context in arctic areas. Ice, acting in a similar way to clouds, can act as a filter for the light, while water, containing all of its microorganisms, can effectively scatter the light. Pushing this connection between underwater Crepuscular Rays and their primary existence in the arctic region, I found further inspiration for my work in images of glacial buildups, known as the Afeis. Formed as water gradually freezes in layers upon itself until it exists in thick crystalline masses, the Afeis has a structured appearance while still being organically formed. At the same time, the masses typically display rich contrasts of blue and white as light interacts with the laminated ice layers. Because of my reaction to their beauty, both Crepuscular Rays and the Afeis were the predominant naturalistic influences for my project.

Precedents:

In order to situate my own ambitions and work within a historical and global perspective, I looked into the work of others, such as artists, designers, architects, and engineers, in order to view and learn from their accomplishments. Specifically, I focused in on those whose work related to light, or to the creation of engaging spaces. Among these, four people became particularly significant to me: Manuel Clavel Rojo, Fabrizio Corneli, Peter Zumthor, and Olafur Eliasson.

Manuel Clavel Rojo is an architect whose works create dynamic spaces through interplays of light with materials. Never doing the expected, his buildings often leverage both natural and artificial light traversing across or through sliced glass or thin stone, such that the material seems to glow. An example of such is found in his building, *Cloud Pantheon*, pictured below. His explorations sparked my own material play, provoking my experiments with light against a variety of materials and pushing my project forward.

Fabrizio Corneli is a light artist whose work displays a deep understanding of how light is affected by obstruction and distance. Typically using only cut metal and a halogen bulb, his pieces cast shadows that range from extraordinary patterns to human forms. Among his pieces, I was particularly drawn to *Equilibrista* because of the way light radiates out from the simplistic

center with different levels of intensity, thus creating a beautiful light composition. In seeing his work, I was challenged to reconsider my preconceptions about light, and to study it more.

Peter Zumthor is a well-known architect, whose physical and written works influenced my project because of his ability to create not just buildings, but atmospheres. Contemplating whether a building should contain space or allow space to “flow” through it, selecting materials based upon how they “feel” in reaction to each other, and always keeping in mind what buildings or environments exist in the surrounding area, his works are frequently successful in existing as emotive and experiential places. The *Therme Vals*, located in Switzerland, is an example of such a work that creates an atmosphere of tranquility for visitors.

Olafur Eliasson is a sculptor and light artist whose studio’s work reaches to create experiences that are ineffable. Known for his installation works, he often makes light a visible phenomenon, just as I was interested in doing. Additionally, his piece called the *Little Sun Project* was inspiring to me because of its small and inexpensive, yet impactful and cohesive, circuitry and formal design. Dissecting his work led to insight into my own.



Figure 2:
Manuel Clavel Rojo
Cloud Pantheon



Figure 3:
Fabrizio Corneli
Equilibrista



Figure 4:
Peter Zumthor
Therme Vals



Figure 5:
Olafur Eliasson
1M3 Light

Environment For The Light: Context

Light is constantly interacting with, and dependant on, its environment; it travels through space as waves of photons, which in turn react to matter within its path. Consequently, choosing

an environment in which my light would exist was critical, particularly as I was endeavoring to have the light interact with its surrounding area. Wrestling with the best way to approach light within space, I turned to Zumthor's method of envisioning his architectural spaces as black voids that could be strategically illuminated. His process prompted me to set the boundaries of my own "black void" so that I could understand the volume and the location with which my own light would be interacting.

I found that I had several possible options, such as a river, lake, pond, puddle, pool, or tank to be my body of water. Of these, I decided that a tank had the most benefits for my particular project. For instance, a tank can offer a significant, yet not overwhelming or underwhelming, amount of water for my project to exist in and affect. Too much water would make the project appear to be irrelevant and force the audience to stay at a distance; too little water would take away the option of the piece being completely submerged. Additionally, a tank lends control to the amount of movement or jarring the light piece would experience, as opposed to rivers or lakes that have currents and live elements to them. Therefore, for the context of my work, I selected a 14" cube tank and designed for it.

Encasement For The Light: Form

While developing a form for the light piece, I received a very valid question that challenged my work as a whole: if creating an experience is so important to me, why is it significant that the piece exist in an object form? After all, numerous artists have leveraged the technologies of computers and projectors to achieve immersive experiences, or have created large installation works in order to captivate an audience with light. However, for me as an artist, there is something irreplaceable and intimate about the creation of, and interaction with, an object. In almost every moment of every day, we are interacting with at least one object, and these interactions affect our lives. Objects can influence our emotions; giving us the pleasure of added comfort and ease for a task or inducing frustration and irritability because of malfunction. We use objects, form attachments to objects, can value objects, and can have experiences because of objects. Acknowledging these facts, and recognizing that my process relies heavily on hands-on play, I felt it

was extremely important for this particular work to exist in an object form.

One problematic part of designing a light piece is the potential for the components to overwhelm the audience, such that “how” the light functions becomes all that viewers can see. My project had to serve its function without revealing all of the effort that went into it; otherwise the focal point would be on anything but the visual dynamic I created. Fabrizio Corneli’s work helped me to see the fine line balance between object and effect, and gave me an example of the successful use of an object emitting light but not dominating the effect it projects. Instead of detracting from the magic of the images cast onto a nearby surface, his setup of a halogen bulb obscured by metal becomes the core of the work, or the heart of its existence. It is centrally placed, but simple in form, so that the organic offshoots of light hold its own. In much the same way, I hoped my work could generate a visual effect, yet have a physical presence as well.

The decision to make my light piece be a physical object also generated a need for its form to strongly relate back to its purpose. Looking at the history of lighting design, lanterns offered much in the way of basic form. The now antiquated version of a flashlight, lanterns have transitioned from being intended for mainly function purposes, to mainly emotive ones. As we developed incandescent bulbs, and then LED’s, lanterns did not die out, but rather acquired a symbolic role associated with highly emotive situations. For example, lanterns are still lit in memory of a loved one, and set adrift for funerals. Or, with a slightly different association, lanterns are lit as a romantic gesture or to set the mood for an amorous evening. Whether uplifting or depressing, there is a cultural understanding that lanterns are for moments of intimacy and value. In contrast, I knew I wanted to avoid visual cues of a disco ball or a lava lamp at all costs. Flamboyant instead of peaceful and gaudy instead of understated simplicity, these were what I didn’t want my audience to recall upon viewing my piece. Consequently, my form began with the basic shape of many lanterns, with a square base and a four sided linear structure. This shape gradually evolved from a rectangular prism into a crystal like shape, with proportions similar to that of a water droplet.

After grasping a basic form, I turned again to the pragmatic requirements of my piece.

Within the form, there needed to be a threaded access port, so that I could turn the light on and off, switch out batteries, and fix any solder connections if the need arose. Furthermore, I needed canals for LED's to slide into, as well as a canal for a transparent sheet of vinyl, so that the LED's could emanate outward, but be protected from water damage. To construct the form and still meet all of these requirements, I opted to design the piece within the 3-D design program known as Rhino and to have it 3-D printed in white ABS plastic.

Yet something still felt lacking with my piece; there was no spark of color or alteration of the light. Having previously explored light's interaction with numerous materials, such as fabrics, metals, plastics, and glass, I found myself unwilling to let an opportunity to go to waste. I was most fascinated with my experiment of light through rough edged glass, which was inspired by Manuel Clavel Rojo's use of the same technique. To my pleasure, I found that layers of the glass brought an aesthetic relating to the Aufeis. Since I did not assert control over the edges of the glass by sanding them or grinding them, the way light refracted through the rough surface had an authentic organic feel that was beneficial to my aims. As a result, a new channel for the glass to slide into was added to my 3-D model, and blue stained glass was purchased and meticulously cut to fit.

After the 3-D model was finished, and the form printed, more work needed to happen in order to waterproof the ABS pieces; unfortunately for my project, 3-D printed parts are not inherently waterproof. Some method of sealing of the microscopic crevices is required. Following some research, I chose to use a process known as infiltration, where my ABS parts were submerged in polyurethane and placed within a vacuum

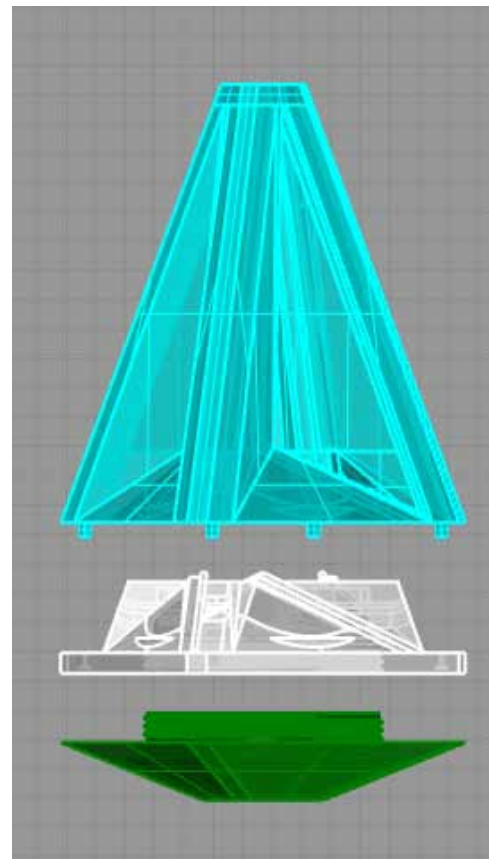


Figure 6:
Stephanie Schutter
Light through the Aufeis, Rhino Model, 2013

until as many of the air gaps as possible were replaced with the polyurethane. Integration of all of the components then began, followed by further waterproofing with Liquid Nails Glue to seal the transparent vinyl, and JB's Water Weld to adhere two of the ABS parts together. For final finishing of the ABS, I applied numerous layers of spray paint to alleviate any light leakage through the translucent ABS plastic and to achieve the final tone of white that I desired.

Creation of The Light: Electronics

In order to gain a stronger understanding of circuits and to have maximum control over the light output, the circuit for my light system was custom designed and made. The circuit consists of an Arduino Mini Pro driver, three shift registers, twenty-four surface mount LED's with appropriate resistors, four capacitors, a JST connector for battery input, and an Single Pole Double Throw slide switch. Selected for its small scale and because of my familiarity with it's basic setup, the Arduino Mini Pro offered me the potential to make use of pulse width modulation, or fading, with my LED's. While fading is not currently utilized in my project, such programmable potential is desirable to create the illusion of movement through the variation of light output, and could be uploaded at any point. Shift registers were included in the circuit to enable the use of a greater number of LED's for greater light output, in addition to making all of them capable of fading. The LED's were chosen based on their wide viewing angle, high millicandella output, and their neutral white color. The entire circuit is powered by a rechargeable lithium ion battery pack, with enough capacity to keep the circuit lit for approximately 10 hours. The circuit also includes the potential for an LED indicator to show low battery levels, should a user wish it.

After constructing my circuit using an Arduino Uno and physical wires to ensure it's functionality, I designed the final circuit

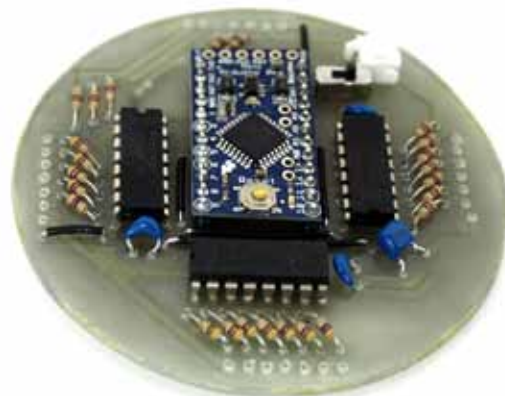


Figure 7:
Stephanie Schutter
Light through the Aufeis, Assembled Circuit, 2013

board within the engineering software known as Eagle. Choosing to produce the boards myself, I then went through a process of printing the design on toner paper, ironing it onto blank copper plated boards, etching it in acid, cleaning the surface, drilling the appropriate sized holes, and then soldering the components. While it was a laborious process, taking this approach allowed me to learn a significant amount while also saving me from the expense of sending boards out to manufacture.

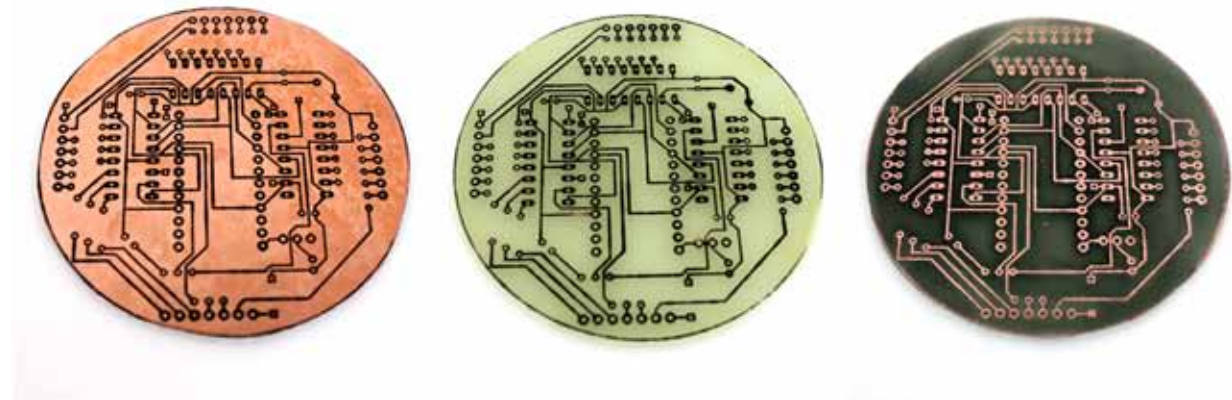


Figure 8:
Stephanie Schutter
Light through the Aufeis, Circuit Boards, 2013

Reaction to The Light: Exhibition

The opening night of the exhibition was essentially the maiden voyage for my piece, and the make it or break it moment in a very literal sense. Therefore, when the piece illuminated for the entire length of the show, intact and watertight, I found that at least part of my project was successful. I did indeed create an underwater light. That said, my piece did not achieve all that I had wished it to, because the only dialogue existing between my light and the water it was situated in was that of silence. For several reasons I can think of, and others I most likely can't predict, the light was not visible within the water and did not extend very far beyond it's form. Furthermore, since this was the first and only time anyone had seen the light piece in it's intended setting, I had no idea what type of experience would be generated by it's existence. While I had hoped to create a moment of joy and provoke audible cries of "ooh!" with the exception of some

small children who were very excited about my piece, I did not hear too much of that reaction. The light piece did, however, cause people to pause and examine what they were seeing, coming as close to the tank as they could, squatting until the light was at eye level, and peering into for considerable lengths of time. Those that did not see the piece entering the tank had disbelief that it was actually underwater; some onlookers even touched the water to see, and were visibly shocked that it was indeed submerged in water. In talking to people, they stated that it reminded them of something of myth, or fantasy, or even futuristic possibilities. Several times I was told it looked to have come from the movie *Atlantis*, Superman's cave, and even from aliens. One person stated that, "It's like a puzzle that I want to investigate. For having such a simple form, there is a lot to explore." Based upon these reactions, I feel that I can say that I created something that instilled curiosity. As a starting point for future endeavors, that is enough. I know now many things I didn't know before, and have great hopes that I can take what I've learned and push it to another level with future works.



Figure 9:
Stephanie Schutter
Light through the Aufeis, 2013

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