

Perception

of

Lighting

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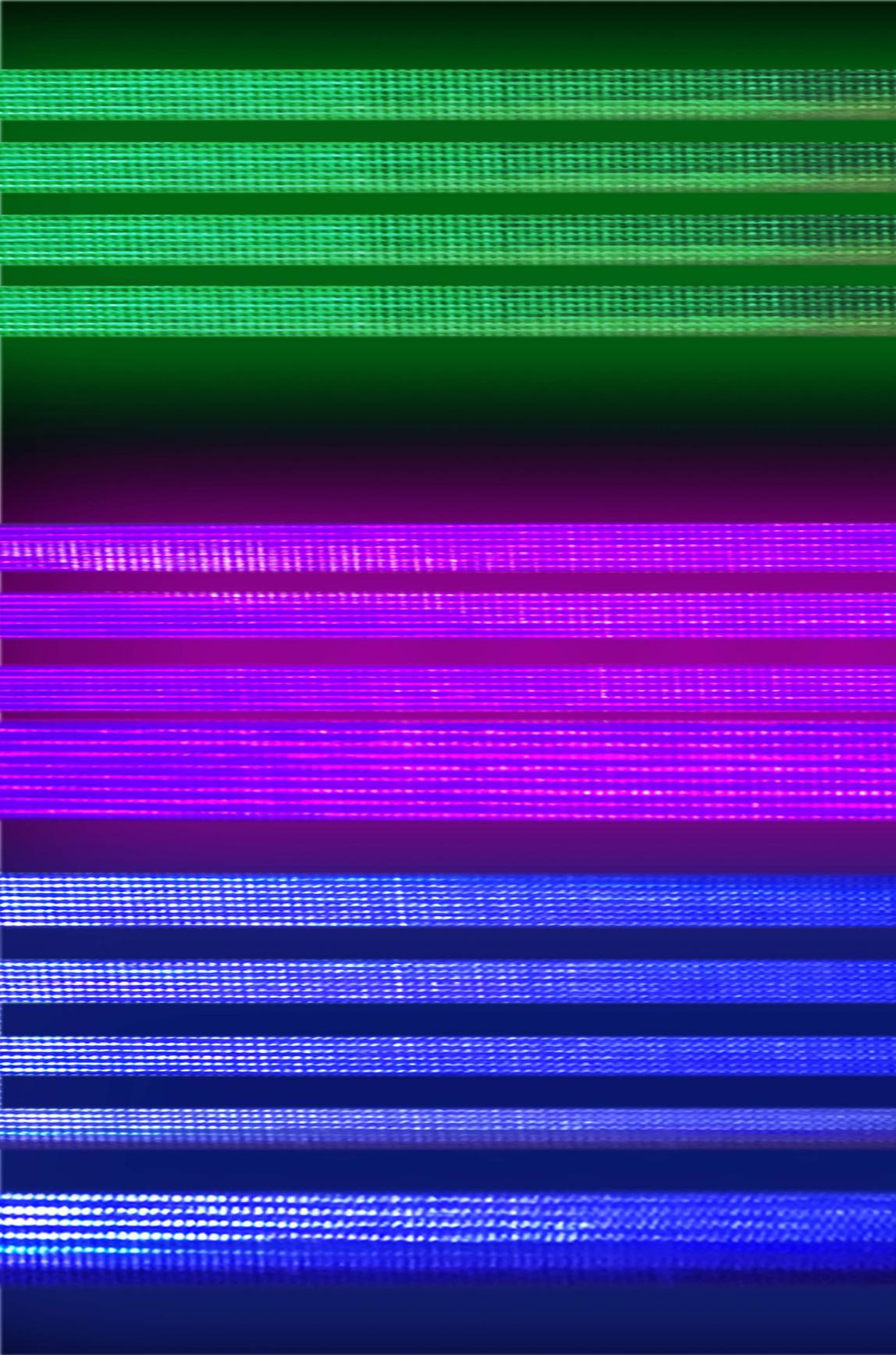
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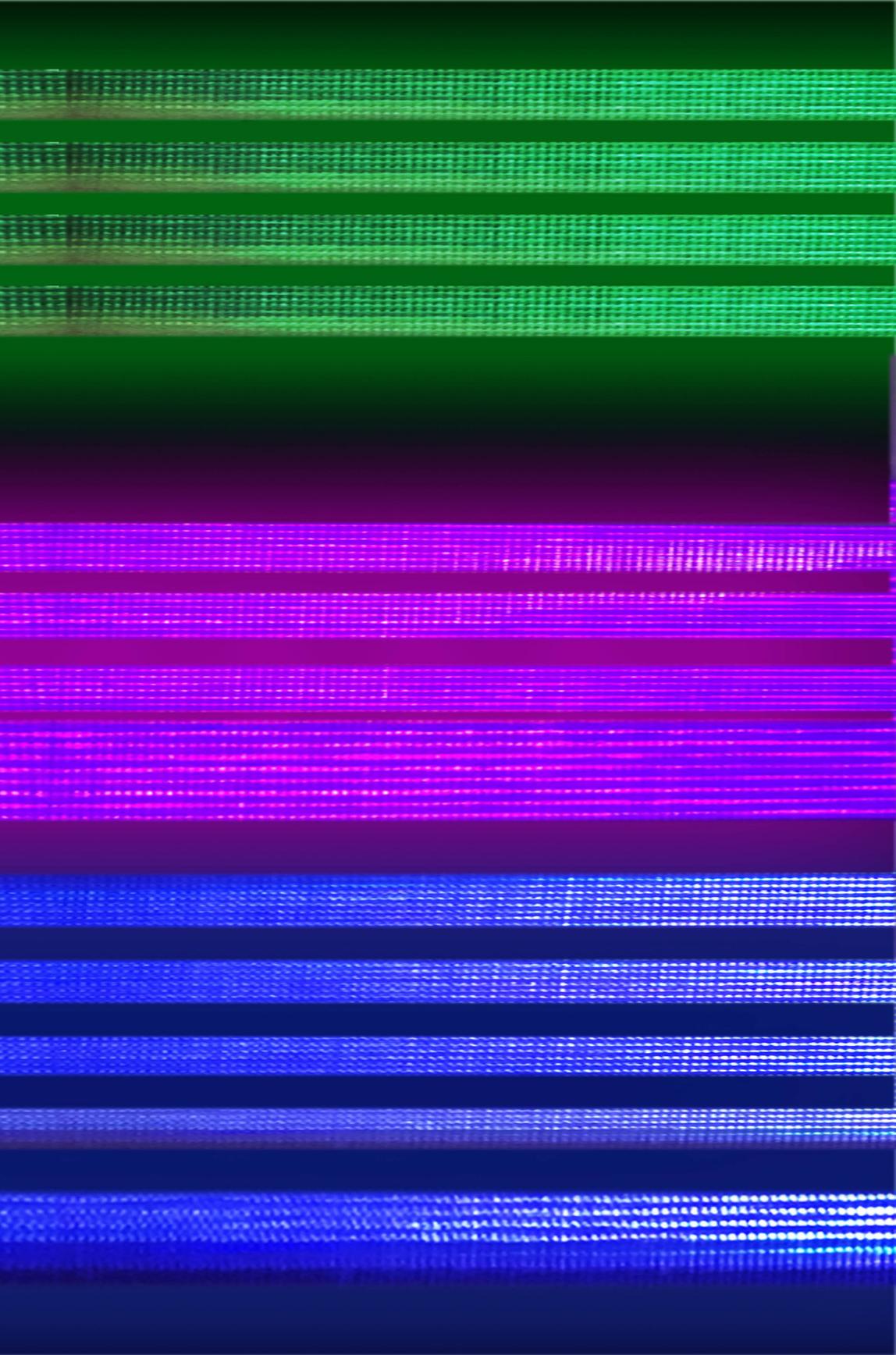
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“Imagine any city as if it were the human body, and think of all the crucial aspects of it which keep us living. Within a city you could consider the people to be the blood; the thing which circulates constantly and gives life. Transport systems are the vessels which allow that blood to move and public infrastructure is the brains of the operation which facilitates the growth and movement of blood cells. Equally important though is that essential organ called the heart. From a geographical sense, the centre of the city is considered the heart however more importantly it’s the spaces within a city which have character, inspire and shape society that are indeed the most heartfelt.”

The Cool Hunters





Abstract

Architecture is designed for the purpose of experience. To compliment the architecture lighting can be used to highlight the exterior and interior spaces. To go beyond complimenting the architecture with lighting we must be aware that during specific months in some regions of the world there is no daylight. The lack of daylight has impact on the human health, especially in Scandinavian regions during the winter months. Therefore, lighting is important during this time. Looking into the history of lighting and how it has evolved, we must think about how can we go beyond lighting architecture with the normal shades of white and yellows that are typically used, and start using colored LED lighting to not only compliment architecture but to enhance a persons experience though architecture. The topic that is being focused on is colored LED lighting. Certain senses can be stimulated from certain colors and colored lights. Along with architecture we must find a way to use colored lighting to improve human health within our buildings. A few artists such as Olafur Eliasson, James Turrell, Sam Eyde, Christine Istad, and Lisa Pacini have created projects that explore the importance of light and colored light that stimulates our senses.

The Evolution

Dating back to the 1800's to now the development of lighting has become stronger with the newest developments of LED's. LED lighting has become much stronger over the years from when it first came out in 1962.[Fig.1] Much like the development of lighting, floor plans have also improved. Looking at floor plans starting from the early 1800's to mid 1900's rooms were closed off and needed their own light source for each room and from the mid 1900's till now floor plans have opened up to where the kitchen, dining, and living spaces flow together and allow indirect light to be used and shared between the open floor plans.[Fig.2]

EVOLUTION OF LIGHTING

Fig.1

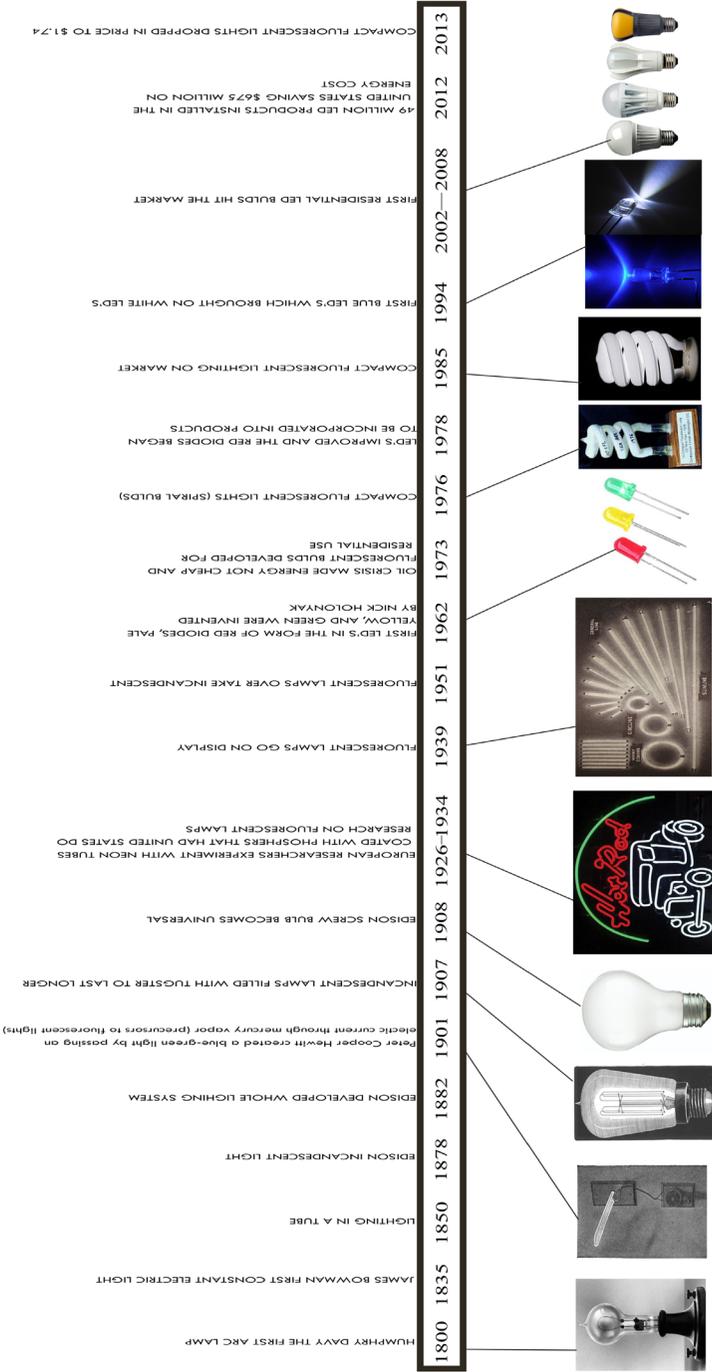


Fig.2



History of lights [Fig. 1]
 The History of the Light Bulbs. N.p., 22 Nov. 2013. Web. 13 Sept. 2015. <http://energy.gov/articles/history-light-bulb>.

History of floor plans [Fig. 2]
 Merymeeting Archives LLC. N.p., 2005. Web. 14 Sept. 2015. <http://www.housemuse.net/homeplan.htm>

Light Healing

The development of LED lighting has become useful with treating certain illnesses. This lighting source is being used in saunas for an alternative healing approach.[Fig.3] White full spectrum LED lights are known to treat certain cancers, and seasonal affective disorders. Blue light emitting LED's are used for the treatment of neonatal jaundice in newborn babies and helps to treat rheumatoid arthritis.[Fig.4] [Fig5]

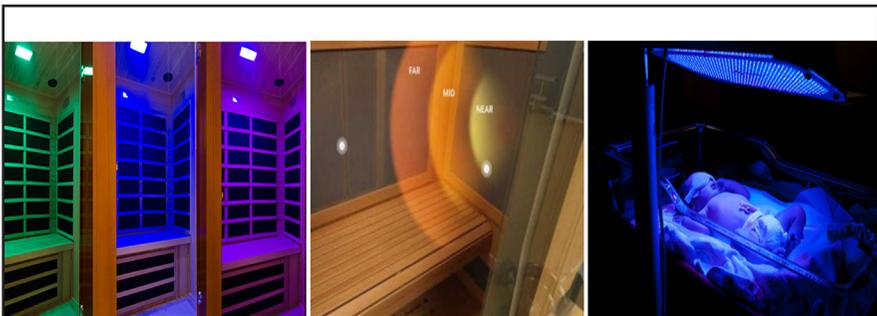


Fig.3

Fig.4

Fig.5

[Fig.3] [Fig.4] Sunlighten Saunas . N.p., 2015. Web. 2015. <<http://sunlighten.com/chromotherapy>>.

Intellectual property research publications commissioned by the Intellectual Property Office . totalhealth . N.p., 24 Mar. 2015. Web. 2015. <<http://www.totalhealth.co.uk/clinical-experts/dr-eliamaalouf/treating-jaundice-newborn-babies>>.

[Fig.5] <<http://www.totalhealth.co.uk/clinical-experts/dr-eliamaalouf/treating-jaundice-newborn-babies>>.

Colored light therapy known as chromo-therapy was practiced in ancient Egypt, Greece, China, and India as it is believed that it can be used to correct energy imbalances which can cause diseases. Chromo-therapist would apply specific colored light to a specific point on the body for different healing effects.[Fig.6]

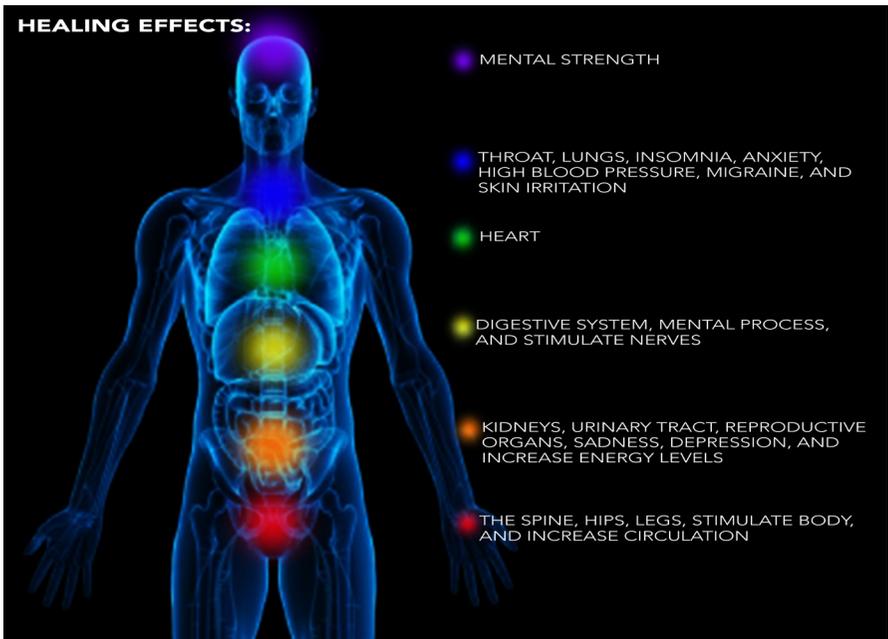


Fig.6

[Fig.6] 123RF. N.p., 17 Dec. 2015. Web. 2015. <http://www.123rf.com/photo_10611451_male-anatomy-of-human-body-in-x-ray-view.>

Senses

An artists by the name of Olafur Eliasson plays with color and lighting to stimulate senses. The Weather Project done by Eliasson is a representation of the sun and sky. The lights used to re-create the sun are mono-frequency lamps to emmit the yellowish color of the sun. A mirror is placed on the ceiling to represent the sky and heaters were also placed in the space to re-create a warm outdoor-scenery with the sun. [Fig.7] Eliasson also created a project called Your Rainbow Panorama using colored glass. His goals for this project is to get in-touch with all your senses while walking through each color phase.[Fig.8]

[Fig.7]

[Fig.8]

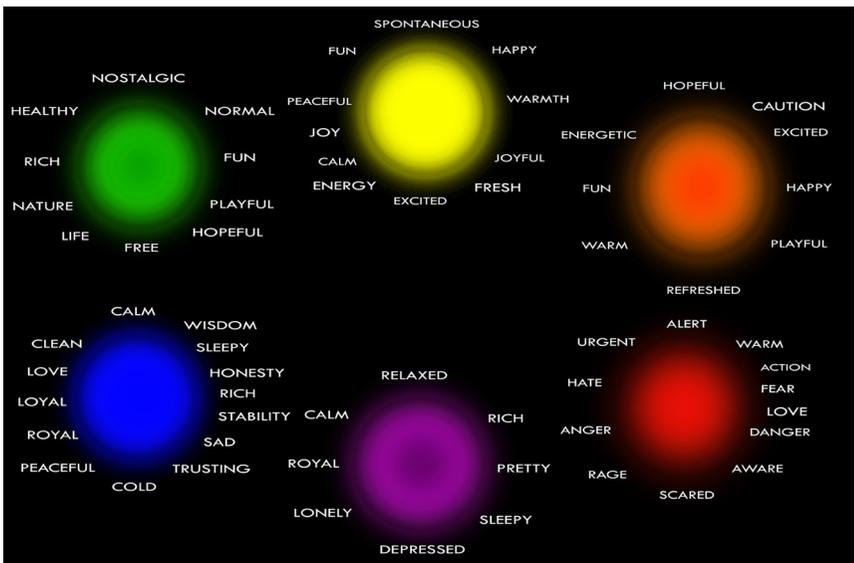


The Weather Project Top Fig.7
Your Rainbow Panorama Bottom Fig.8

Eliasson, Olafur. Studio Olafur Eliasson GmbH. N.p., 2004. Web. 8 Sept. 2015.
[Fig.7] <http://olafureliasson.net/archive/exhibition/EXH101069/the-weather-project>.

Eliasson, Olafur. Studio Olafur Eliasson GmbH. N.p., 2011. Web. 2015.
[Fig.8] <http://www.thecoolhunter.net/article/detail/2333/rainbow-chapel---shanghai>.

Conducted a survey of experience through color by asking several people what feelings comes to mind when seeing the colors: orange, yellow, red, green, violet, and blue.[Fig. 9] The main goal of this exercise was to explore the colors associated with specific senses. With the support of research on color and how each color can stimulate certain senses in the human body the results of this survey matched with the color associations that were found in the research. What was found is that the color blue is associated with making people feel relaxed, calm, happy, comfort, peaceful, and hopeful. Red would remind people of love, romance, awarness, and fear. Violet is associated with sleepiness, clamness, royalty, and richness. Green has been found to be associated with relaxing, refreshing, quietness, nature, and healthy. Yellow and orange were both found to be associated with happieness, and energetic.



[Fig.9]

Light Study



In attempt to explore the stimulation of senses associated with color, a series of light boxes were created at a small scale.





The light cylinders created is a study to explore light installations and explore the effects of light and shapes.

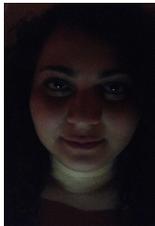
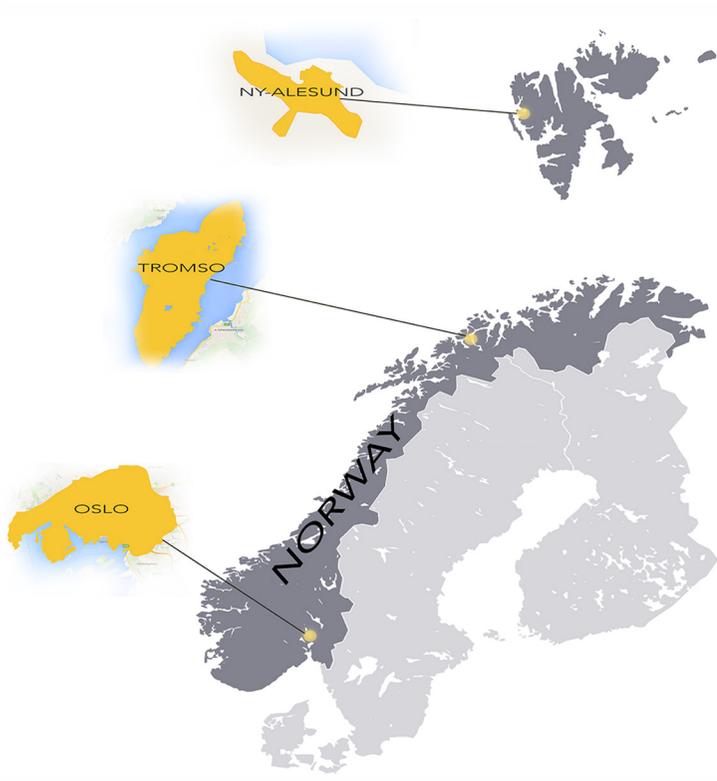


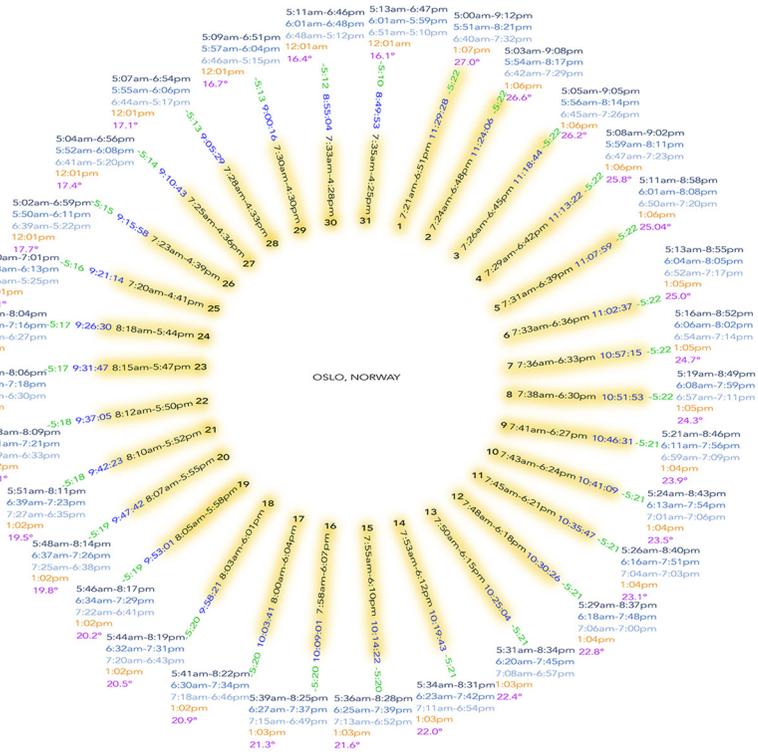
The Infinity mirror box was a study of a visible representation of LED lights and how your eyes can interpret the reflective surfaces and how the materiality can alter our perception of light.

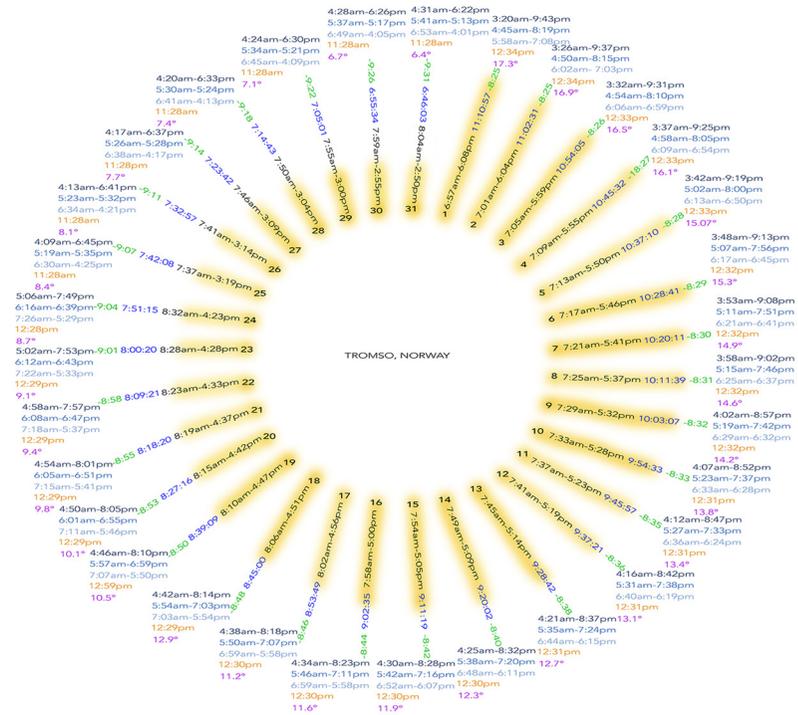


Daylighting Health

With the lack of daylight during the winter months in certain regions around the world seasonal affective disorder is a big concern, especially in Scandinavian regions where sunlight may not be seen for months. Focusing on three regions in Norway: Oslo which is the southern part of Norway, Tromsø which is the mid region of the country, and Ny-Ålesund the most northern region and looking into the amount of sunlight they receive during the month of October, I found that although Norway does have shorter daylight hours in the winter, sunlight hours in the month of October in Oslo is much greater than Tromsø and gets even shorter as you go north up to Ny-Ålesund where by the end of October the sun does not come up making this city more prone to seasonal affective disorder. In [Fig.10] it demonstrates the effects of what daylight can do to a persons mood and health.

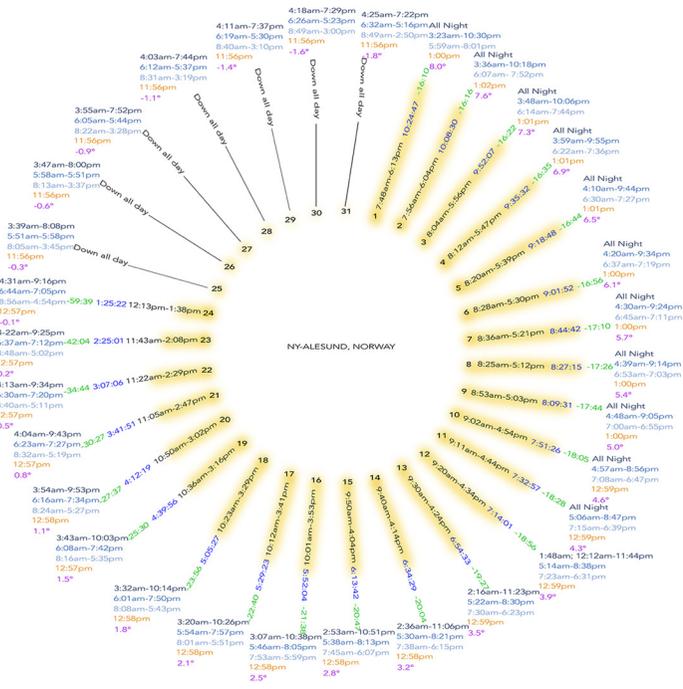






Top Fig. 14
Bottom Fig. 15





Top Fig. 16
Bottom Fig. 17



[Fig.11,12,14,16] Thorsen, Steffen. N.p., 2015. Web. 2015. <http://www.timeanddate.com/>
 Tools for consumers and designers of solar. N.p., 2015. Web. 2015. <http://www.sunearth-tools.com/index.php>.



Created by Sam Eyde, The Mirror Project was created to capture the reflection of the sun during the months that this norwegian village Rjukan does not see the sun.



Created by Christine Istad and Lisa Pacini, Intentions of The Traveling Sun is to bring the sun to any place at anytime and to imitate the phases it goes through from morning to sunset.



Designed by Chinese studio Coordination Asia The Rainbow Chapel was created with many colors for the intentions of it being the 'heartbeat' of the city.



LED panel that gives the illusion that the sun is shining.

Top Left Fig.18 The Mirror Project is a small town in Norway where they placed giant mirrors to capture the suns reflect in the main town square
 Top Right Fig.19. Traveling sun created by an Norwegian artist Pacini Istad
 Bottom Left Fig.20 The Rainbow Chapel in Shanghai
 Bottom Right Fig.21 LED panel artificial sunlight

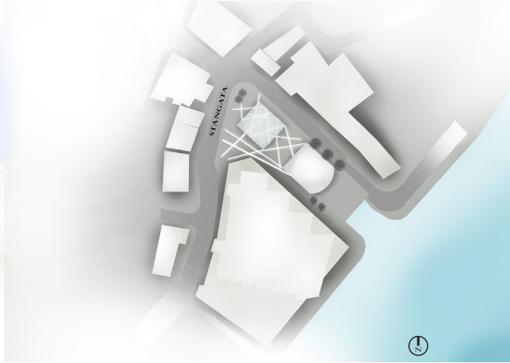
Jordan, Tom. Norwegian mountain town installs giant mirrors. N.p., 1 Nov. 2013. Web. 10 Sept. 2015. <http://www.cnn.com/2013/11/01/travel/rjukan-sun-mirror/>.
[Fig.18] 2015. <http://www.cnn.com/2013/11/01/travel/rjukan-sun-mirror/>.
[Fig.19] pacini, Istad. installation. N.p., 1 Nov. 2012. Web. 5 Sept. 2015. www.artubeart.blogspot.no.
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[Fig.21] home/new-led-panel-technology-uses-nanoparticles-accurately-mimic-daylight/.

Sketch Problems

Site Plan

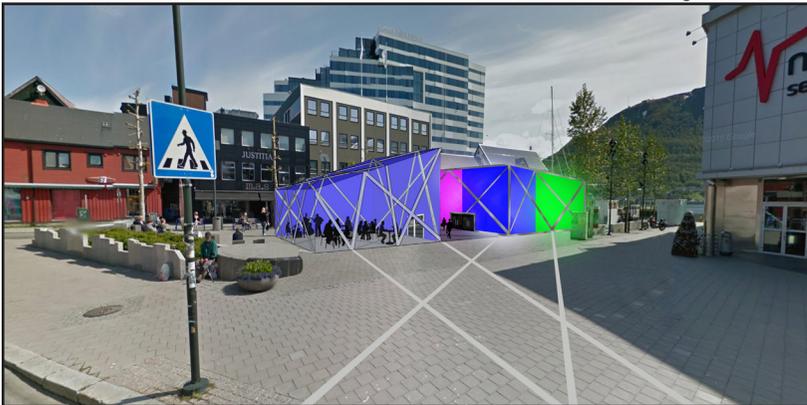


Fig. 22



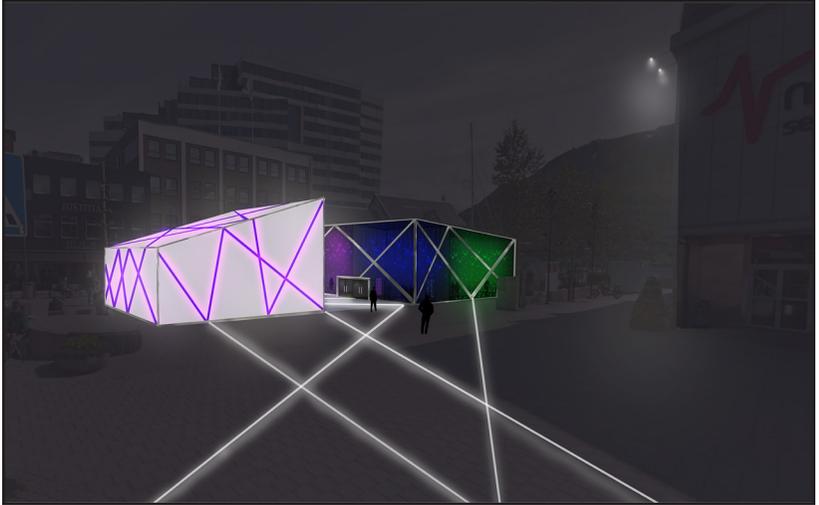
During the winter months in Norway there are many festivals, and event which helps with fighting depression during the winter months. In Tromsø there is a small shopping district and down one of the busiest shopping streets a sketch problem was created in the plaza of Sangata St.[Fig.22]

Fig. 23



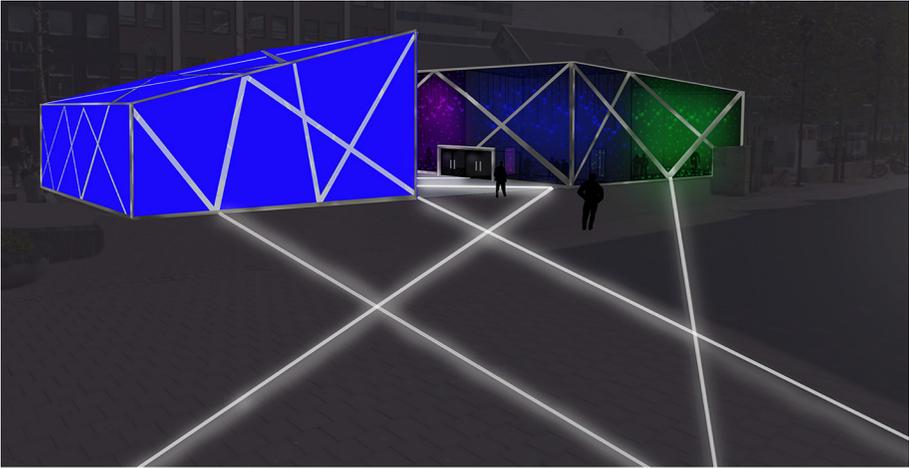
The two structures that were created as a sketch problem are opened to the public and where created to compliment the shopping scenery, events, and festivities that go on in this area not only during the winter months but also all year around. [Fig.23]

Fig. 24



The first structure on the left can host events, vendors, compliment festivals, hold small concerts, and become a place where shoppers can sit and relax. The materials for this structure are translucent changing panels which, plays a major role in what is happening in the space. During the day the panels are translucent from the outside so you are able to see everything going on inside the space, and once you are inside the space the color light on the panel will mainly be blue which is not seen from the outside of the panel which give a one-way vision effect. The color blue will give a relaxing type of environment to the shoppers around and can be altered to accommodate what is going on in the space during the day. During the evening the panels on the building will become non-translucent with a glow of any color that the owner/vendor wishes.[Fig.24]

Fig. 25



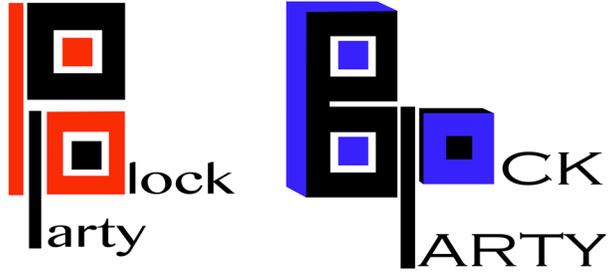
For the second building on the right the opposite effect is happening during the day with the materials of the panels. The panels during the day will not be translucent and will be lit with different colored LED lights. This second building that was created is a series of infinity mirror rooms with hanging LED lighting emitting a certain color in each room that is open to the public. [Fig.25]

Fig. 26



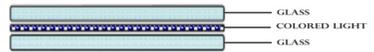
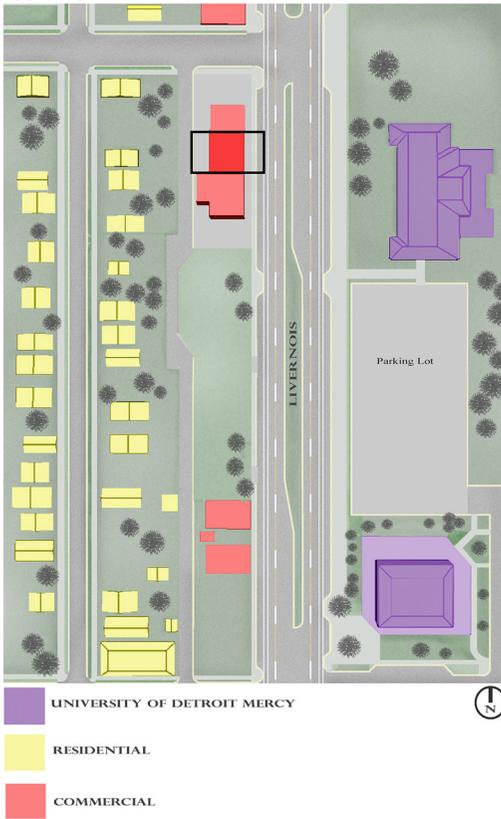
The goal of this building is for people that are walking through these rooms to get in touch with there senses. During the evening the building materials will transform and the panels from the outside will become translucent exposing a two-way mirror effect showing everything that is on the inside of the building from the outside.[Fig.26]

With the same idea of transforming the facade of a building with lighting during the evening hours I created a second sketch problem for a company named Block Party where part of the façade would be covered in frost type panels [Fig.27] during the day giving this company a certain look and at night the panels will light up into what the host/owner wants the color of the panels to be to compliment the event in the building. The goal for Block Party is to bring large and small communities together for social gatherings, events, and everyday meet-ups. In an attempt to make this happen Block Party will house a café and sandwich shop. With this in mind and the support from previous research on color and the senses that each one stimulates, I experimented with multiple colors for the branding of 'Block Party'[Fig.28] and its facade with colored lighting.[Fig. 29, 30, 31]



Site Plan

Fig.28



TRANSPARENT CHANGING GLASS



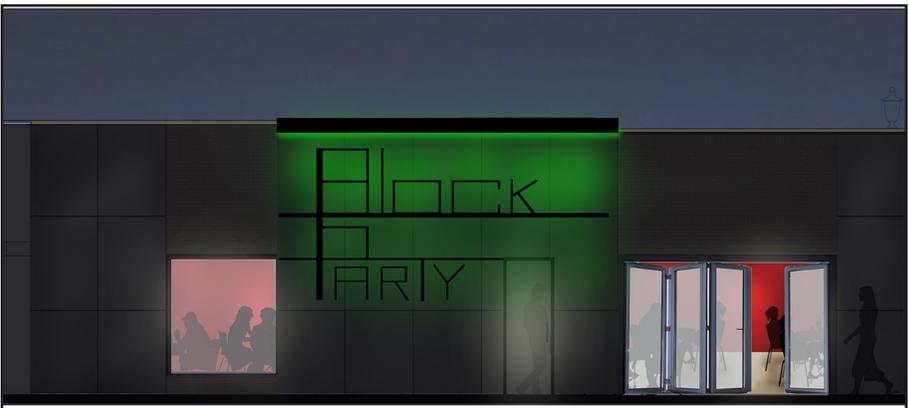
Fig.27



Daytime panels



Evening time LED lights will change the appearance of the building depending on the event.



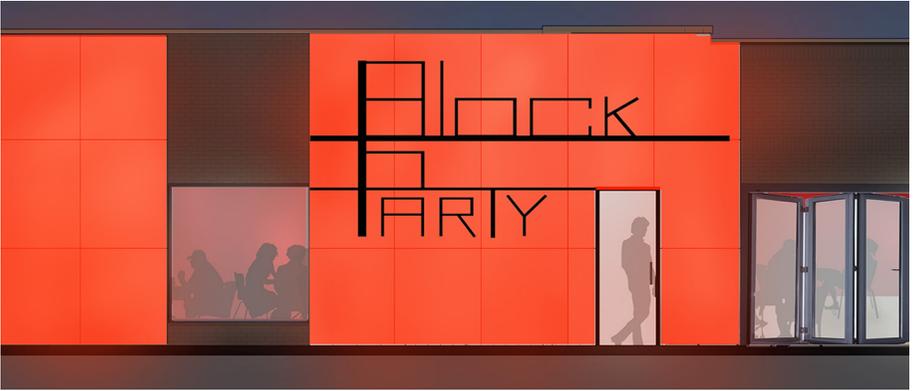


Fig. 29

Panels will transition in the evening with LED back lighting to accomodate event.

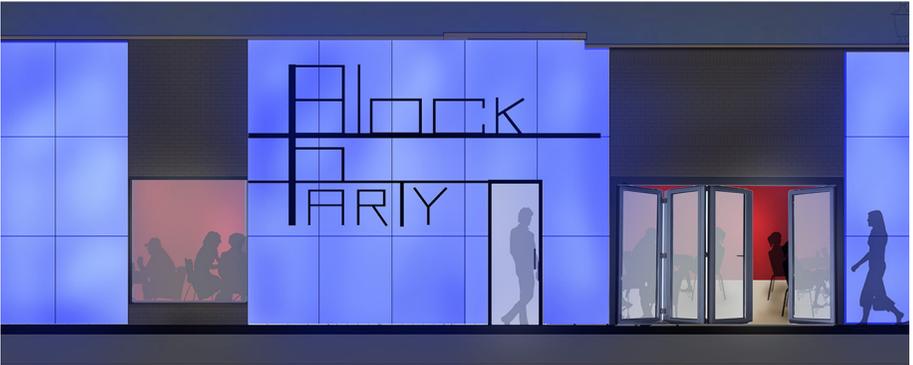


Fig. 30



Fig. 31

Physical Experiments

To explore a more realistic experience between colored LED lighting, the environment, and the person, physical experiments were created at full scale using LED lights, and testing the lighting against various materials such as white semi reflective boards [Fig.31], and reflective mylar [Fig.33], white nylon fabric [Fig.35].

The model created in [Fig. 31] uses white semi reflective boards that captures the reflection of each colored lights that face the boards [Fig 32]. Each LED strip hangs a few feet away from the board, and the reflection of all the colors hitting the board at once gives an appearance of one color, but when the person walks in between the lights and the boards their shadow will reveal all the colors that are reflecting on the white boards. The experiance of this is to explore the stimulation of senses through degrees of colored shadows. The model was a success with the colored shadows, but the down fault was the lights shinning and irriating the eyes because the lights were exposed with no filter.

Fig. 31

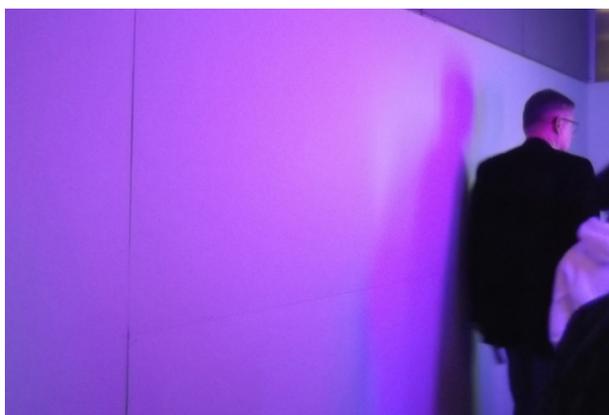
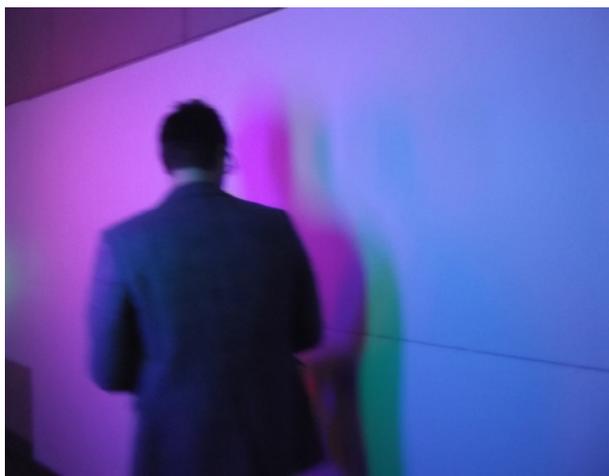


Fig. 32

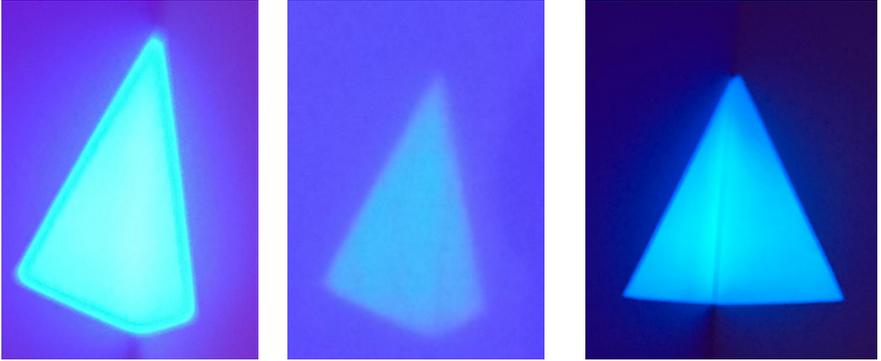


Fig. 33



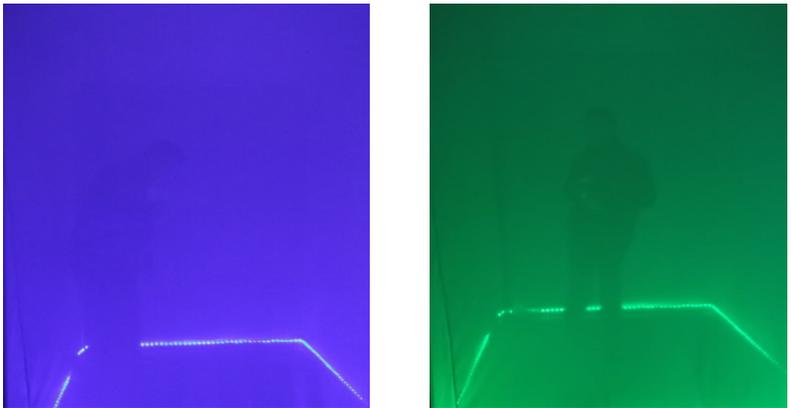
Full scale mirrored box was created using mylar and LED pin lights. As the LED lights hang at different heights the mylar is used around the interior walls of the box. The mylar material was used to multiply the illusion of the amount of LED lights in this space. [Fig.33] The downside to this model was that the mylar was not placed on the floor, because of this it did not give the full effect of an infinity mirror. Also this model needed more in lights to hang lower for different height variations.

Fig. 34



A reenactment from James Turrell, the 2D triangle appears to be 3D when projected on a white board and on an angel. The wall that the shape projects on plays a major roll in the way the 2D shape is bent so that it folds in a certain way that the image will appear 3D. [Fig.34]

Fig. 35



The Chromotherapy box was built made of thin nylon fabric and projecting LED light strips along the bottom of the box. Each colored lighting reflects upward on the fabric creating a trasparent wall allowing the person to experience the colored lights from the outside before entering the box. Once inside the box the person can change the color of the lights to accomidate the persons liking and stimulate the senses.[Fig. 35] In this model the lights were also exposed and hard on the eyes.

Full Scale Improvements

For the first model in [Fig.31 & 32] the lights where repositioned to the ground level and slightly tilted to face the white boards [Fig. 36] To reduce the harsh brightness of the lights each LED strip were placed in a frosted tube which decreased the brightness and still gave the same amount of color reflection on the white boards.

Fig. 36



With mylar added to the ground and the additional lights added and positioned at lower lengths, the mirror box became complete. Adding the additional mylar on the ground gave a full illusion of an infinity box.[Fig. 37]

Fig. 37

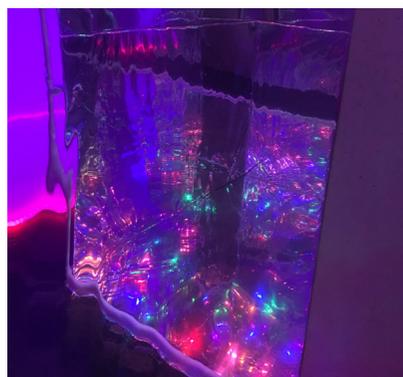
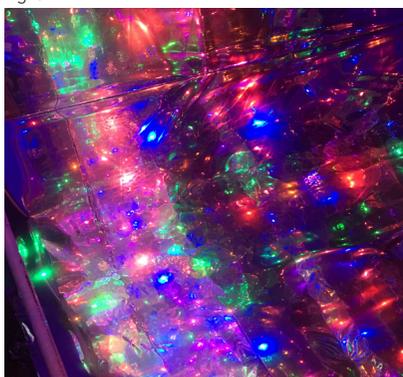
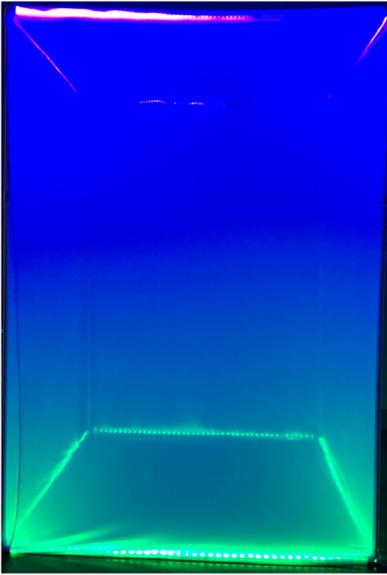


Fig. 38



Dimming down the harshness of the LED lights, the UV coded clear PVC pipes that house the lights helped control the brightness. Also adding lights to the top of the box helped give more transparency. [Fig. 38]



The model that was created in [Fig. 39] are LED light strips embedded into a wall which gave an indirect glow of the colored light. These light would reflect of a material called kalwall which are semi transparent wall panels. [Fig. 40]

Fig. 39

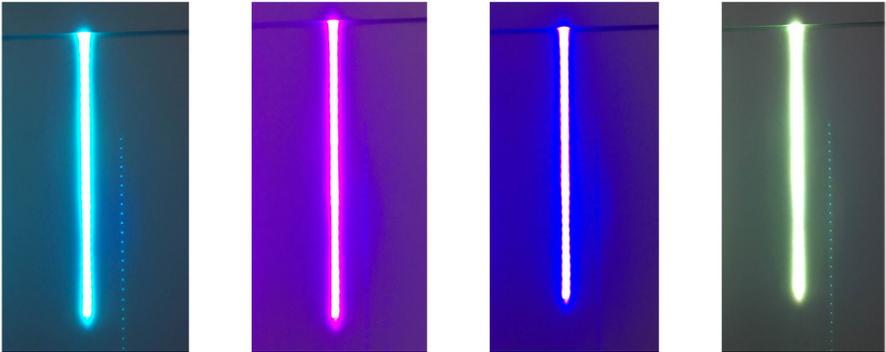


Fig. 40

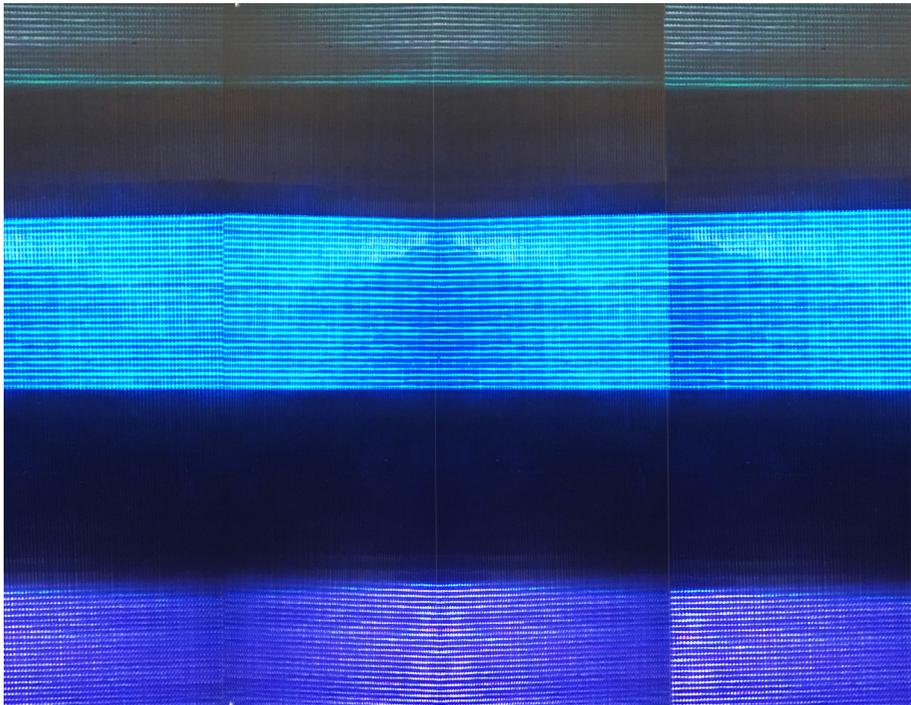
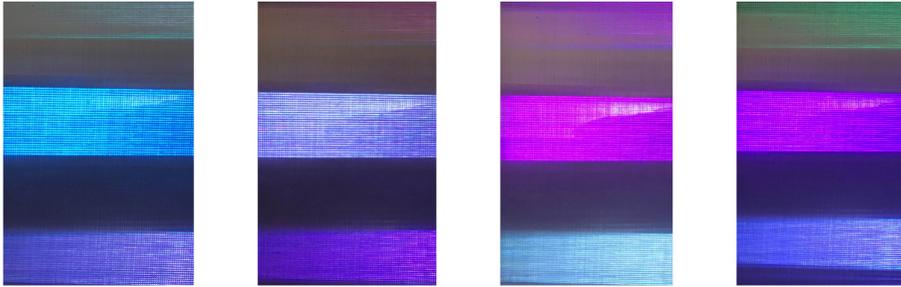


[Fig.40]

Kalwall. "John Fry Sports Park Pavilion." The Marc Boutin Architectural Collaborative. N.p.: Bruce Edward, n.d. Print.

When the LED lights reflect on to the kalwall panels the light carries across the entire panel in a horizontal form and because the wall is transparent the lights give the same effect between the interior and exterior space. [Fig. 41]

Fig. 41



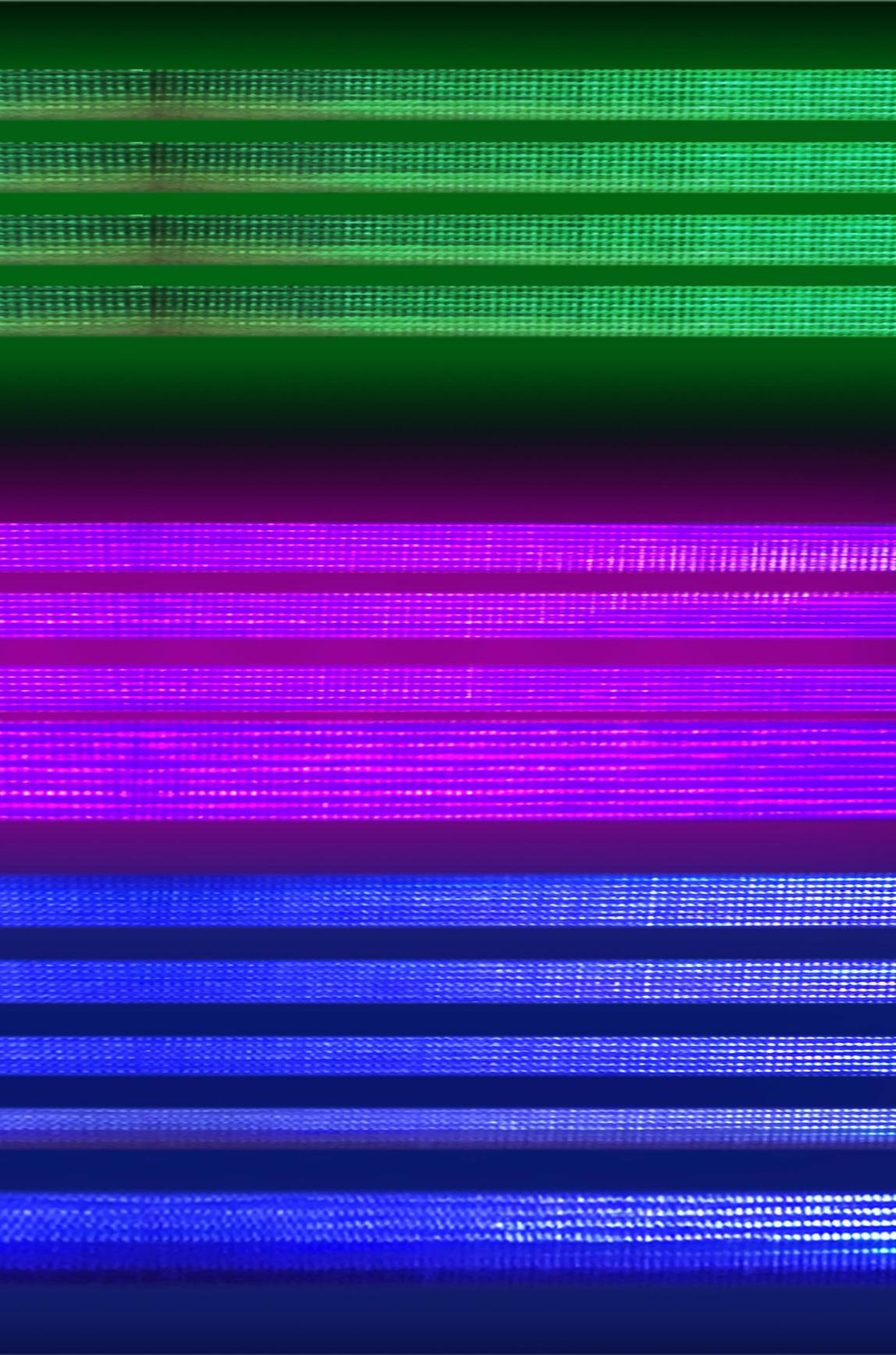
Implementations

One example is a hospital where patients, staff members, and visitors can experience the stimulation of senses with their own colored shadows, or in a waiting room full of mirrors and pin LED lighting, where you can change the lights to a certain color creating a more calm waiting experience. [Fig. 42]

Fig. 42



With the full scale light experiments and how to get the person engaged with the surrounding environment through the stimulation of senses, these light experiments can be implemented in several ways. Colored LED can be implemented with architecture from the interior space of a building to the exterior and beyond some examples to implement colored lighting; hospitals, daycare centers, treatment center, malls, restaurants, and work environments. Light is all around us, but if architects and designers are more aware of the benefits that colored LED lights have on human health we can start to improve the health and experience we have in a silent and elegant way.



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