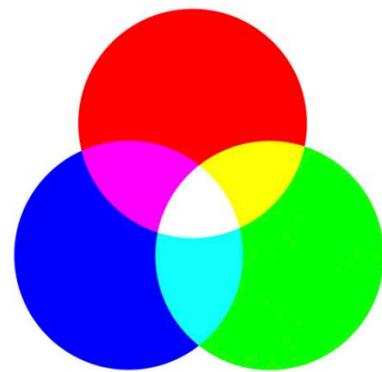


# Color Theory

Things learned from the class at Texas A&M University



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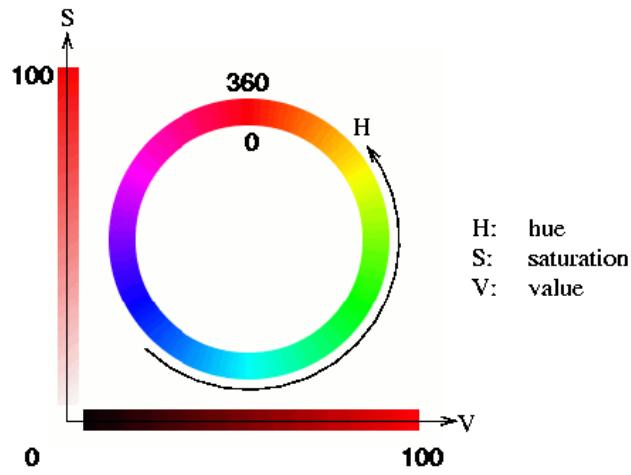


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# Properties of Color

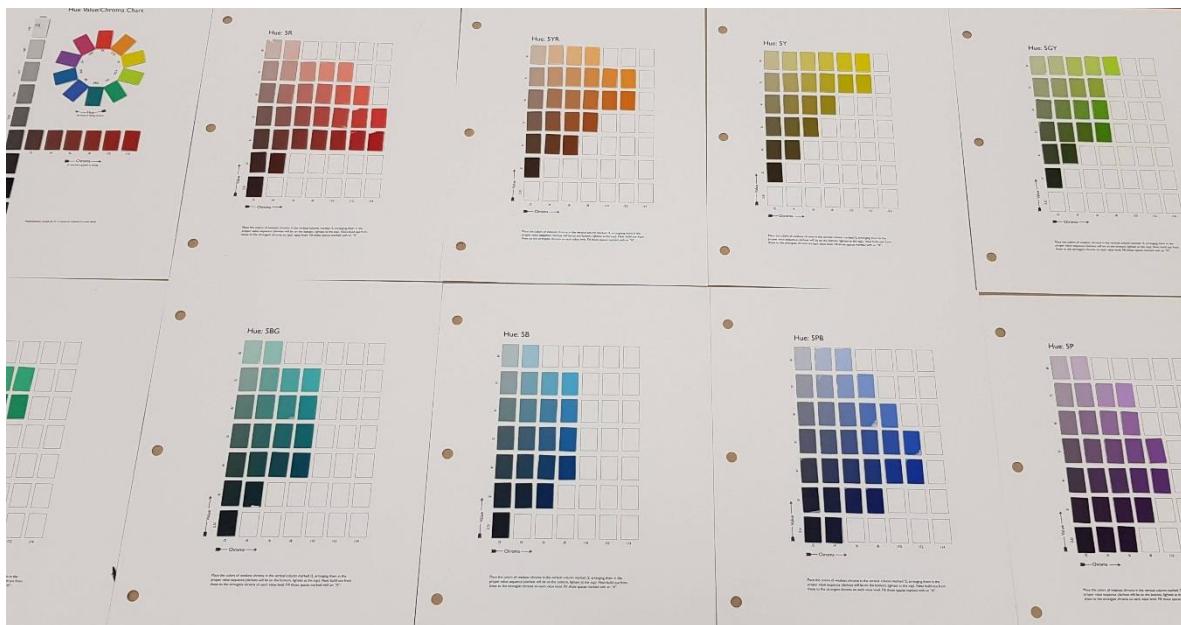


There are different ways to communicate a specific color, for example by name. One person can say “the car is blue”. The name *blue* gives us an idea of what range of colors we can be talking about, but there are many different tones of blue we can be talking about.

So, for that purpose it is necessary to have an objective way to determine a specific color and we do that by giving its

coordinates in a 3-dimensional color space. There are different color spaces, like RGB, CMY or the one that can be seen in this picture HSV. This last one is probably the most intuitive for humans, hue represents the color family, value how much of the light is reflected by that color and saturation is how much the color is mixed with white. The colors can also give a sense of temperature, for example orange is a warm color and indigo is cool.

## Munsell



We trained our eyes to distinguish between colors of the same hue by using the Munsell system.

# Color Wheel

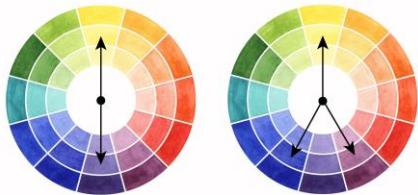


We painted a color wheel with 12 different hues and tint, tone and shade for each of them.

Color wheels are useful for comparing between different colors and establishing relationships, for example **color harmonies** which are defined using the position of colors inside the wheel.

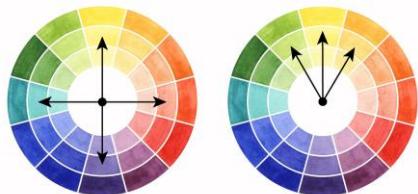
Also, one can create the colors in between two colors by mixing certain amounts of the two. For example, by adding a little of yellow to red you get orange, and by adding more you get yellow-orange.

## Color Harmonies



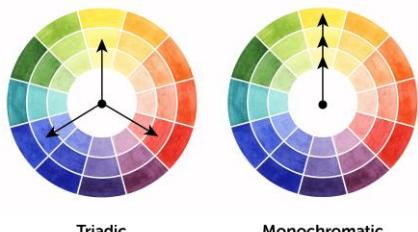
Complementary

Split Complementary



Double Complementary

Analogous



Triadic

Monochromatic

## Color swatches compositions

By using simple abstract shapes, we made different compositions to explore color balance.



Figure ground composition comparison. Good vs poor figure ground composition.



Color distribution comparison. Color repetition should create unity (left), too much variety could be unpleasant but too much repetition could be boring.



Value balance.

Darker shapes are more dominant than lighter shapes. One can balance it by using smaller darker shapes and larger lighter shapes.



Chroma balance.

High chroma shapes are more dominant than low chroma. A small high chroma shape (left) can balance with a large low chroma shape (right).



Temperature balance.

Warm colors are more dominant than cool colors. A small warm shape (left) can balance a large cool shape (right).



Gravity sensation.

Some colors are often seen on the bottom of a composition and when they are arranged at the top, they can look like they are floating and defying gravity.

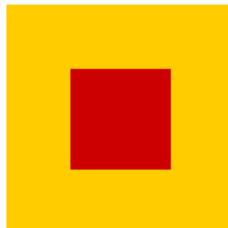
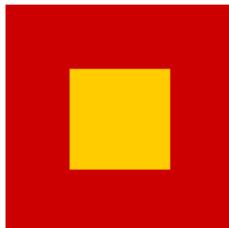
## Color Proportions

The amount of each color that are used in a composition is very important and they can evoke different sensations to the viewer depending on that.



This exercise arranges the colors used in the image by an approximation of the proportion of how much they are used.

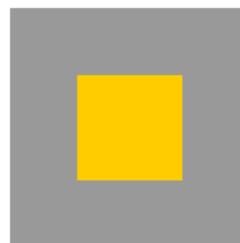
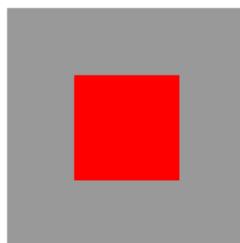
## Itten's 7 contrasts



Contrast of Saturation. Two colors of high saturation produce a high contrast.



Contrast of Temperature. A cool color and a warm color produce high contrast.



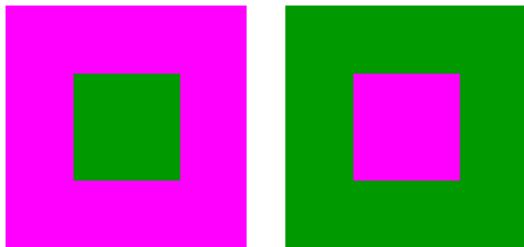
Simultaneous Contrast. The high saturation color induces its complementary color to the gray area.



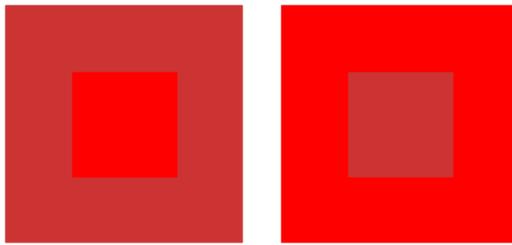
Contrast of Proportion. The difference of size in a color produces a quantity contrast.



Contrast of Value. A light color and a dark color produce a high contrast.



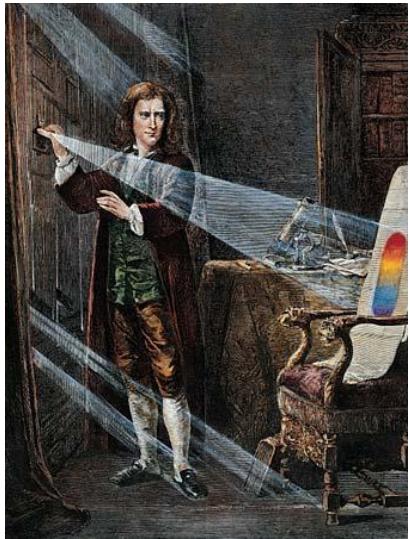
Contrast of Complementary Colors. Two opposite colors in the color wheel produce a high contrast.



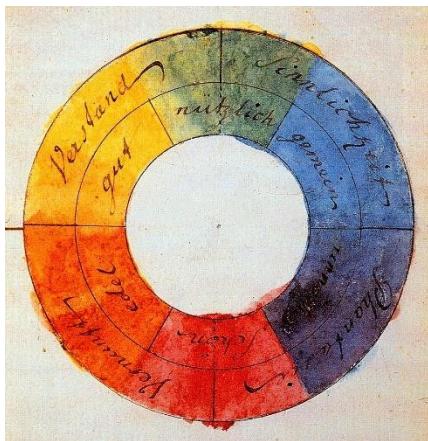
Contrast of Hue. This type of contrast is produced when the colors are the same hue but different saturation.

(Images from <https://www.pinturayartistas.com/los-7-contrastes-de-colores-de-johannes-itten/> )

## History of Color



Sir Isaac Newton in 1704 used a prism that refracted the sun light to see the colors produced. He counted 7 different hues.



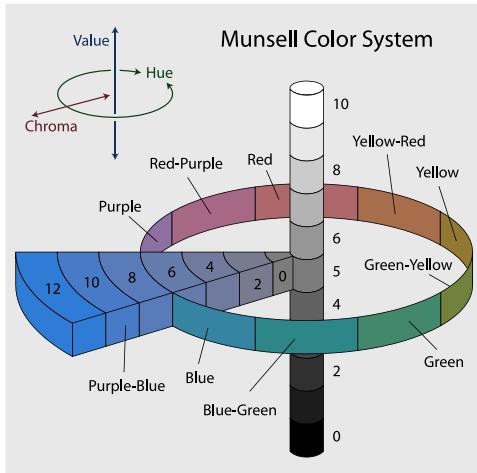
Goethe from Germany publishes “Theory of Colors” in 1810. He discovers the complementary colors and associates an emotional meaning to them. In his book he details how a colored light cast a complementary color shadow.



Chevreul, a famous French chemist, publishes “Laws of Contrast of Colors” in 1839. His research in color led to the concept of Simultaneous Contrast and he calls *induced* to the color affected by other.

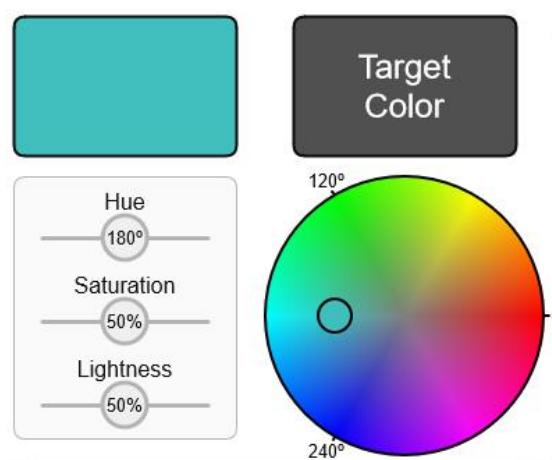


Josef Albers, a German artist from Bauhaus did further studies on color. In his *Homage to the Square* he explores how using different colors in the squares can make them look like popping out.



Albert H. Munsell, an American painter, creates a color notation system in 1905 that uses hue, value and chroma.

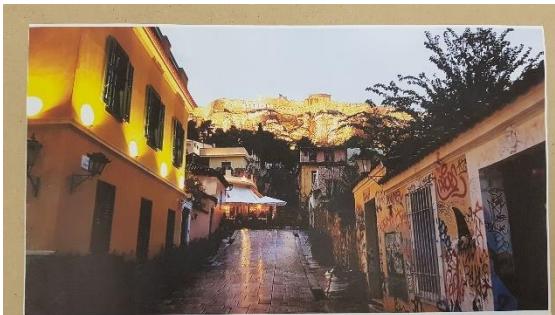
## Color Website



In the class we presented one website with information about Color Theory. I picked *Pixar's in a Box* which is a web course about different aspects of animation. One of the topics is Color Science and they have an HSL color matching exercise on which you have to move around hue, saturation and lightness variables to match a given color.

## Color Complements

We did a complementary colors project on which we had to choose a Color Harmony of complements and make an acrylic painting with those creating vibrating boundaries (an effect of discomfort on the eyes produces when looking at two complementary colors that are next to each other).



Reference image that I took in Athens



Sketch using tracing paper



Starting to paint



Yellows and yellow-oranges painted



Blue-violets



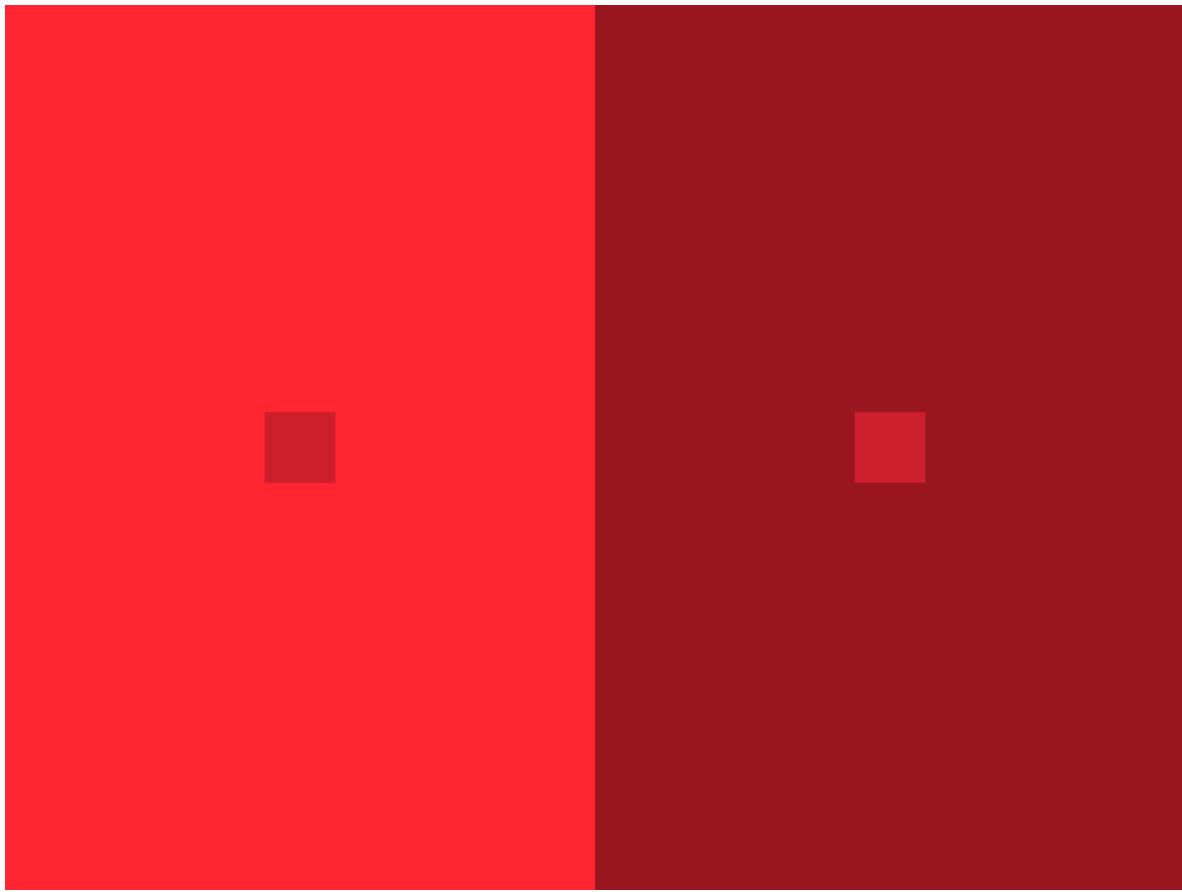
Mixing color complements to reach gray  
(YO-BV)



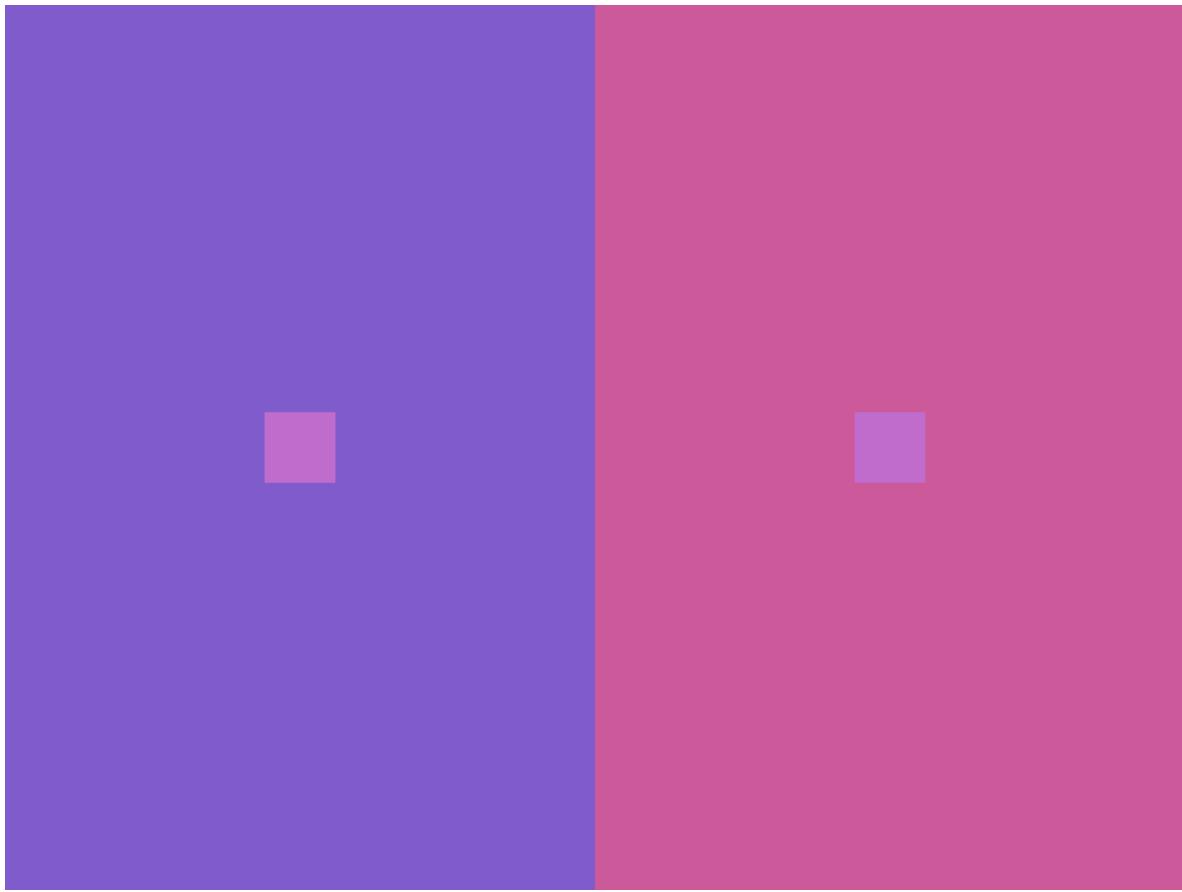
Final product

### Albers Simultaneous Contrast

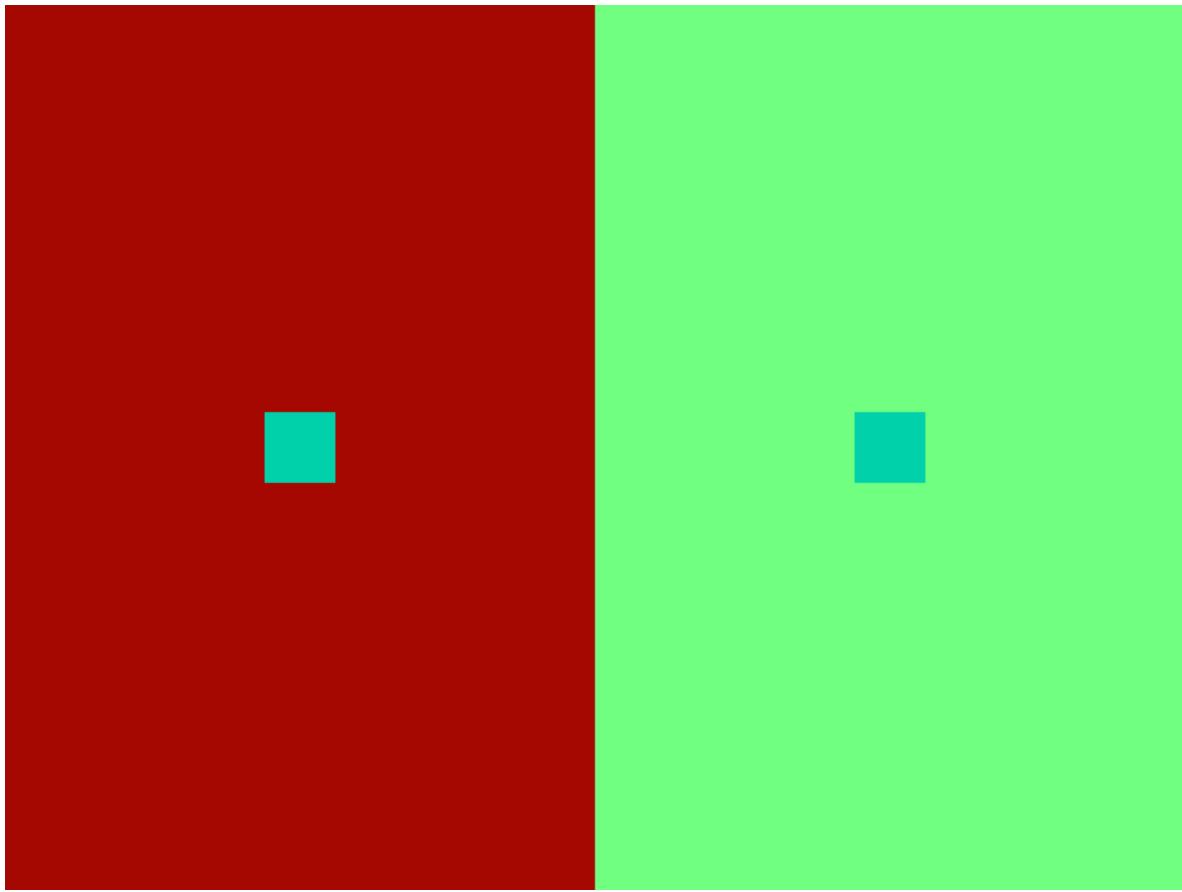
In his book “Interaction of Colors”, Albers presents many examples of how the brain generates different perception of colors by how they contrast with their surroundings. We had to replicate similar examples. I put up a website with 4 examples that you can see in: <https://hernaldo.me/color-theory/>



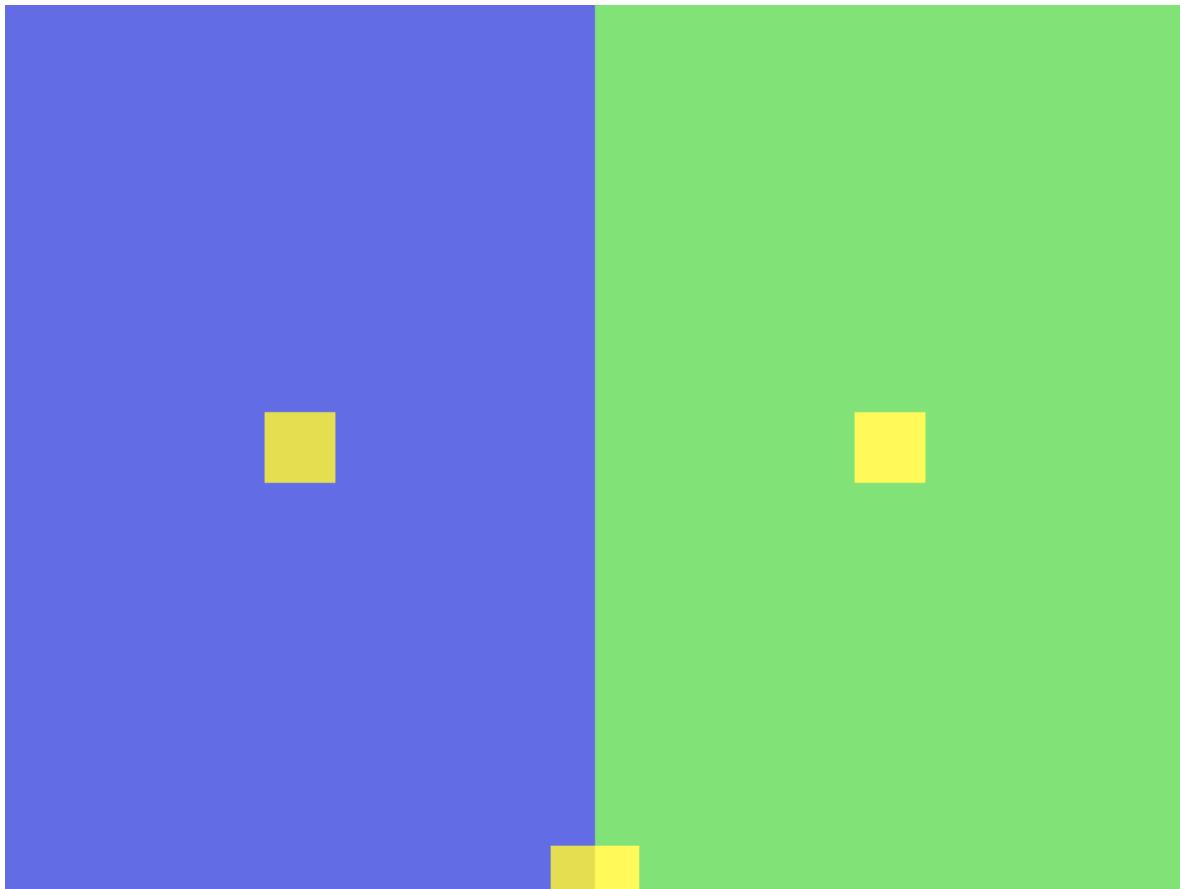
Monochromatic, two different colors and the squares are the same mixture of the two colors.



2 hues, and the squares are the same mixture of the two hues.



3 hues, the squares are the same hue that is different from the other two.

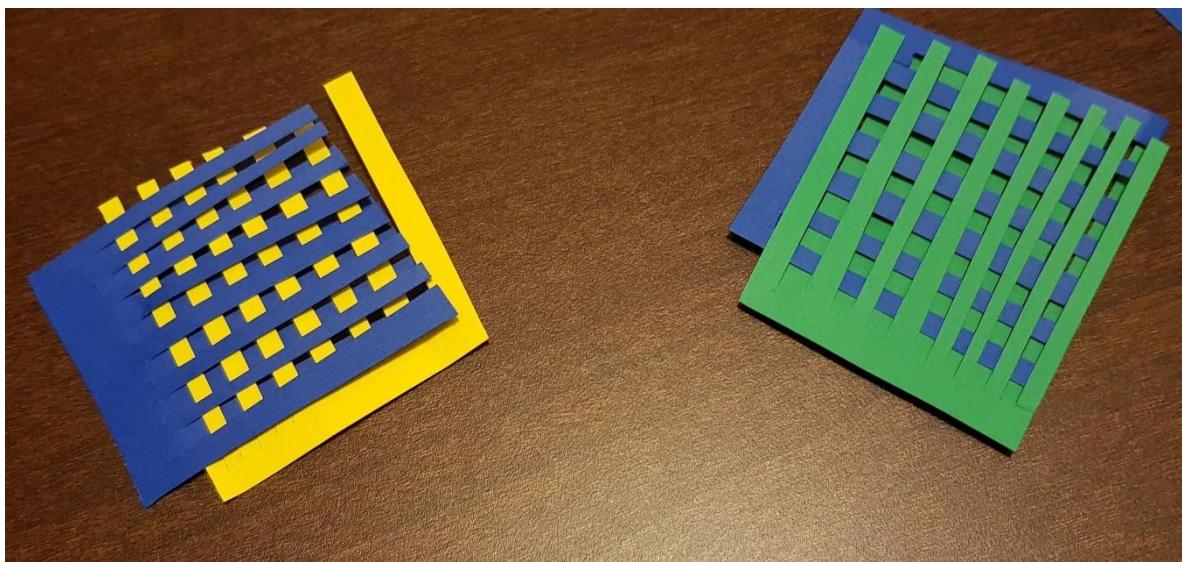


This last experiment does the opposite, there are 4 different colors, but the squares look identical.

### Optical Color Mixing

This is an optical phenomenon that happens when two or more small areas of different colors look like a new color which is not there.

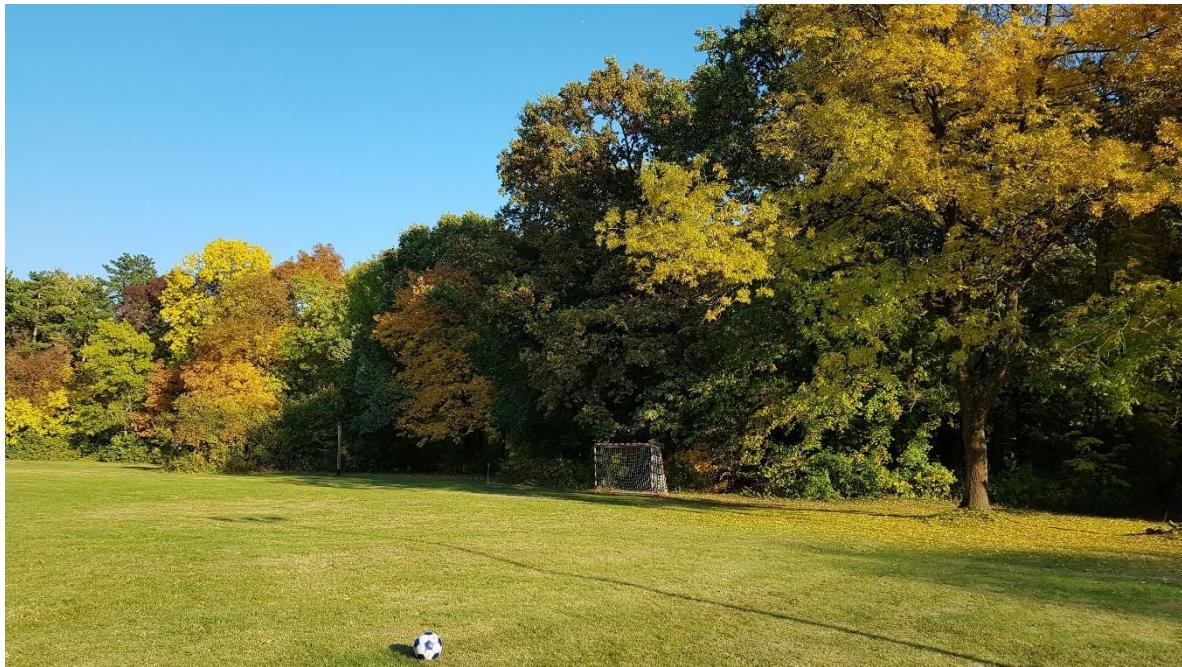
## Exercise



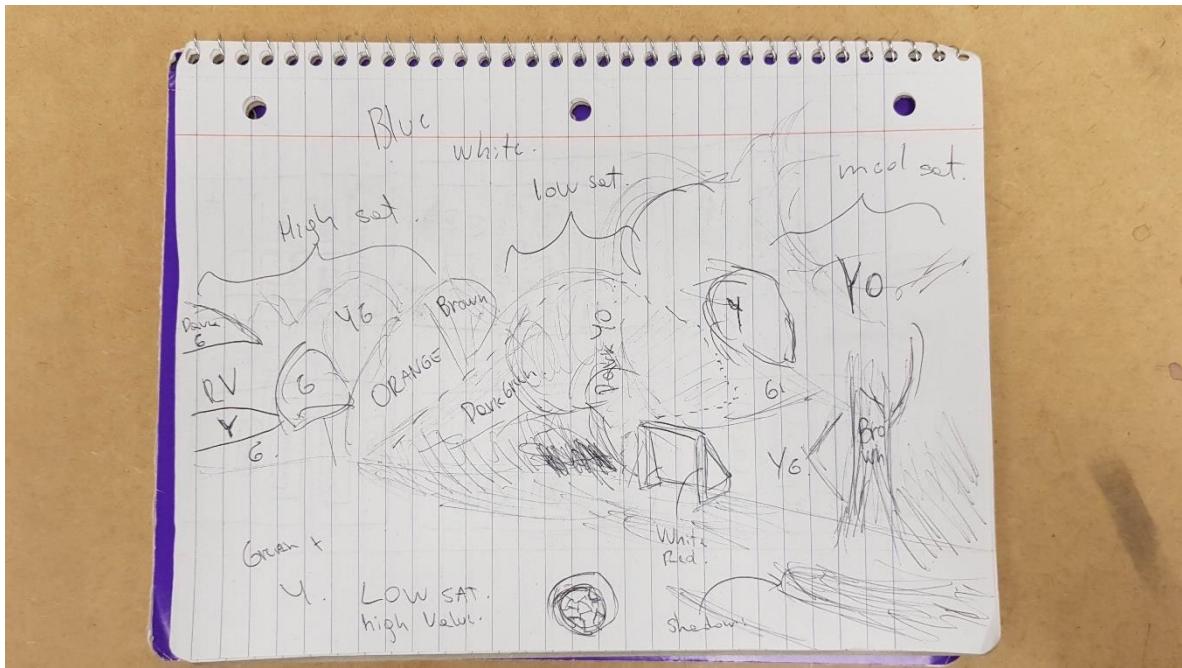
I tried to do a manual approach to optical mixture with colored papers, we realized that it wasn't very successful because the blue is too dark. For an optical mixture the colors must be similar values

## Painting

Pointillism is an example of optical mixture in traditional painting. We had to do a pointillist style painting and I did one using digital painting in Adobe Illustrator.



I took this picture in Hungary in the campus I was studying/living in 2018. I used this as reference



Sketch of the painting with the layout of the colors selected

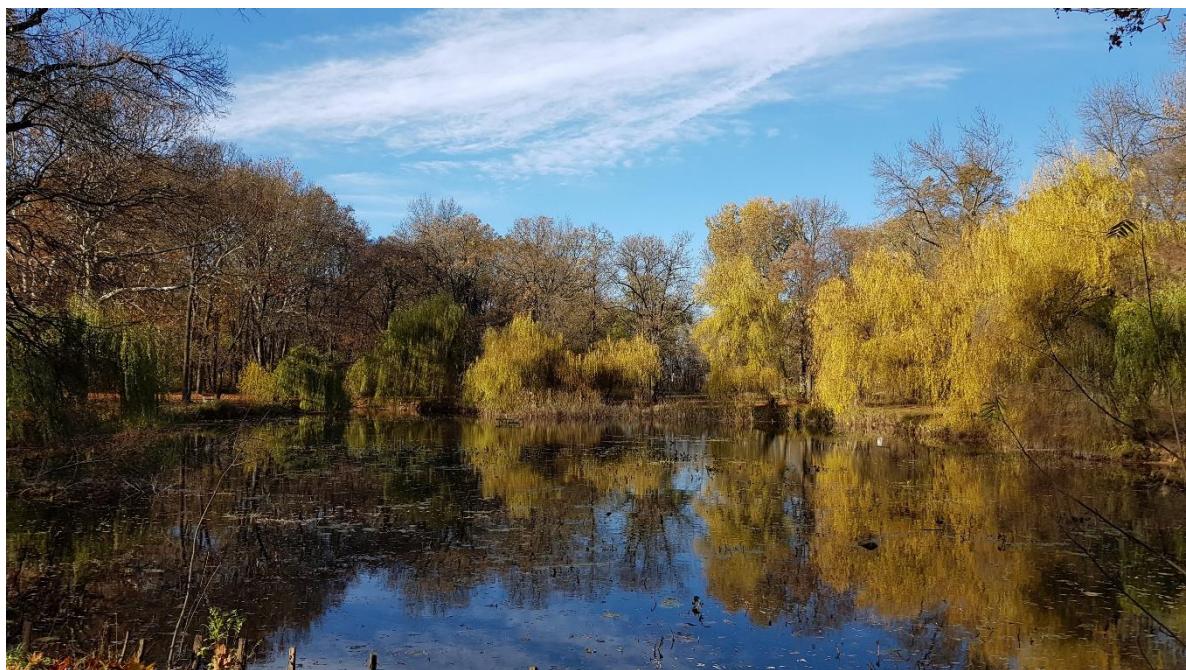


Final product

## Colors in Seasons

During the 4 seasons (Spring, Summer, Autumn, Winter) there are different colors around nature. Here are some pictures that I took last year (2018-2019) on different seasons.

### Autumn





Pictures I took in the same campus on Hungary (Word of Life campus)

Winter



Photo from the same campus

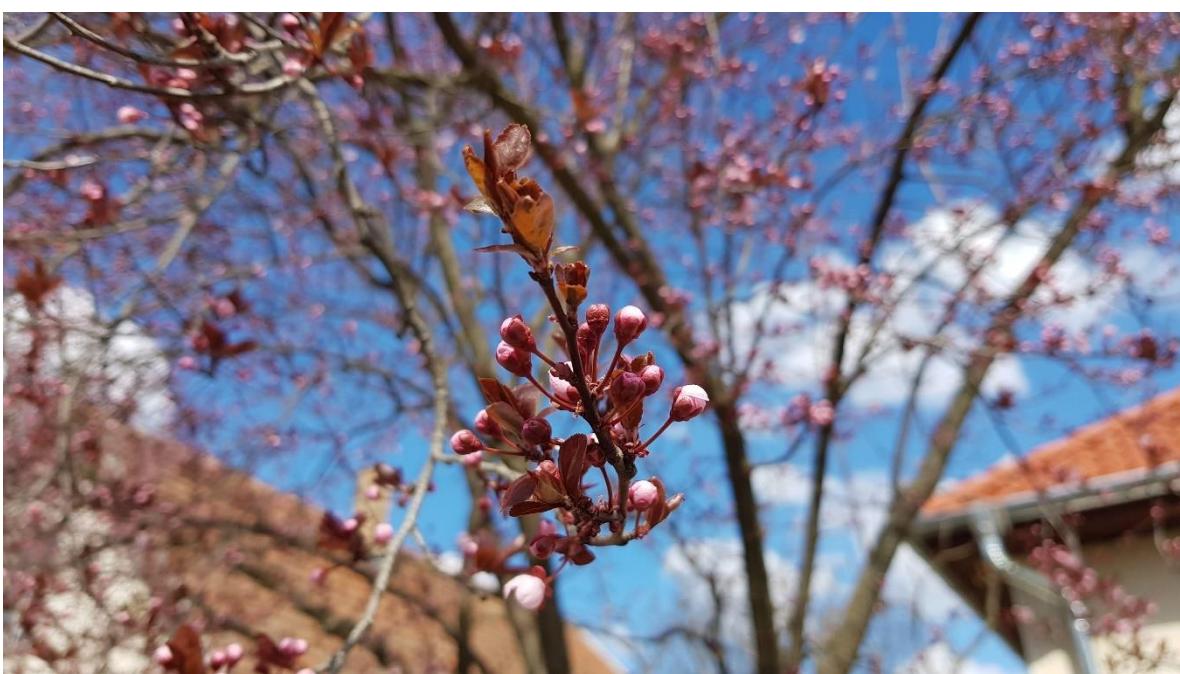


Photo from the town in Hungary

Spring



Campus in Hungary



Flowers in Israel Spring 2019



## Lighting

Color by itself doesn't exist. To be seen by the eyes it always depends on light. We see the color that is reflected on the surface that has a specific wavelength. Depending on the color of the light too, what colors would be seen, even the shadows can change colors.

## Painting



The Cross in the Wilderness by Thomas Cole, 1844. This painting deals with lighting and **atmospheric perspective**, which is that the objects that are further away appear duller (because of the particles in the air that are in between).



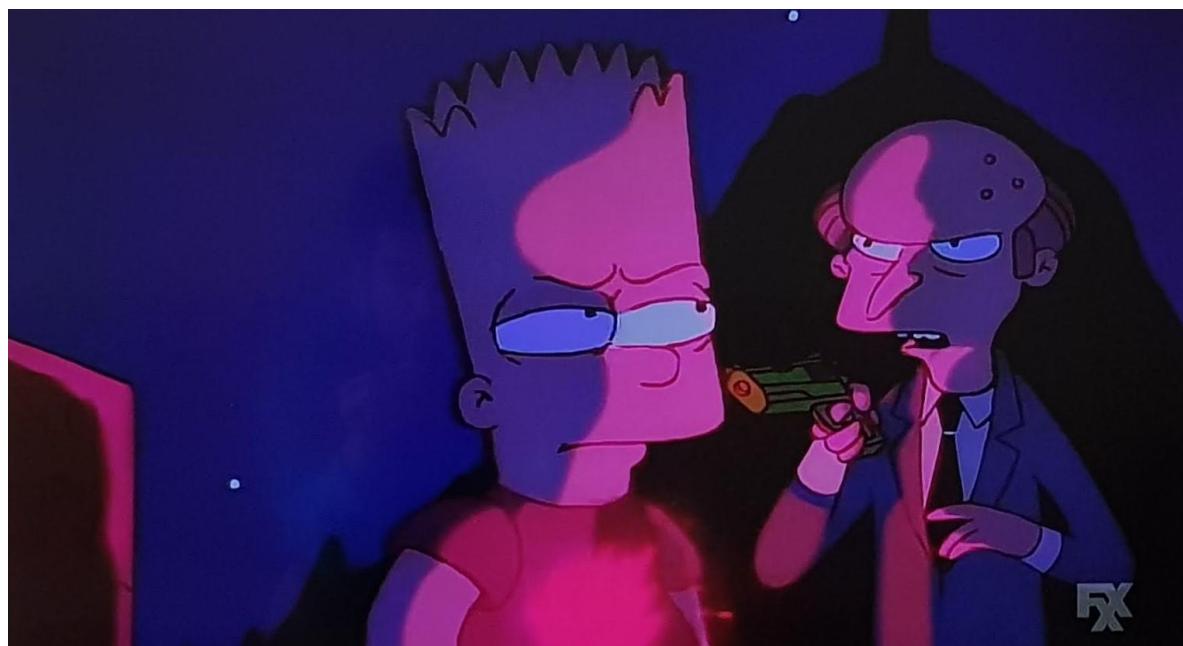
khanacademy.org

The Sleep of Endymion, Anne-Louis Girodet de Roussy-Trioson, 1791



Burial of Atala, Anne-Louis Girodet de Roussy-Trioson, 1808.

## Cartoons



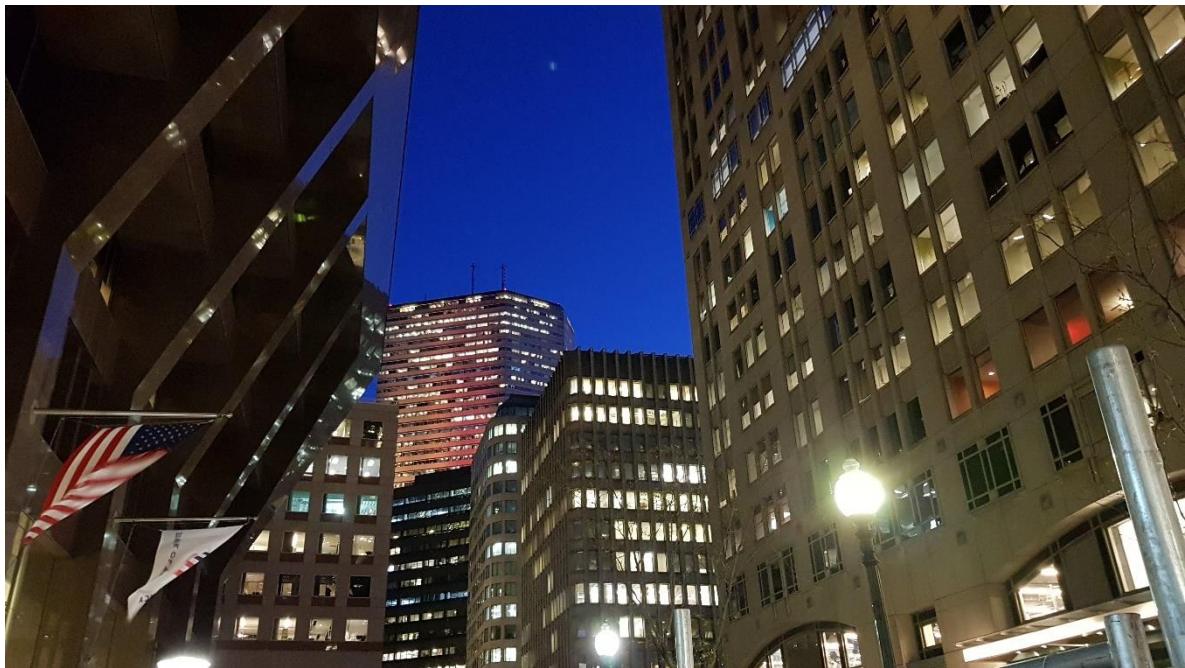
## Pictures



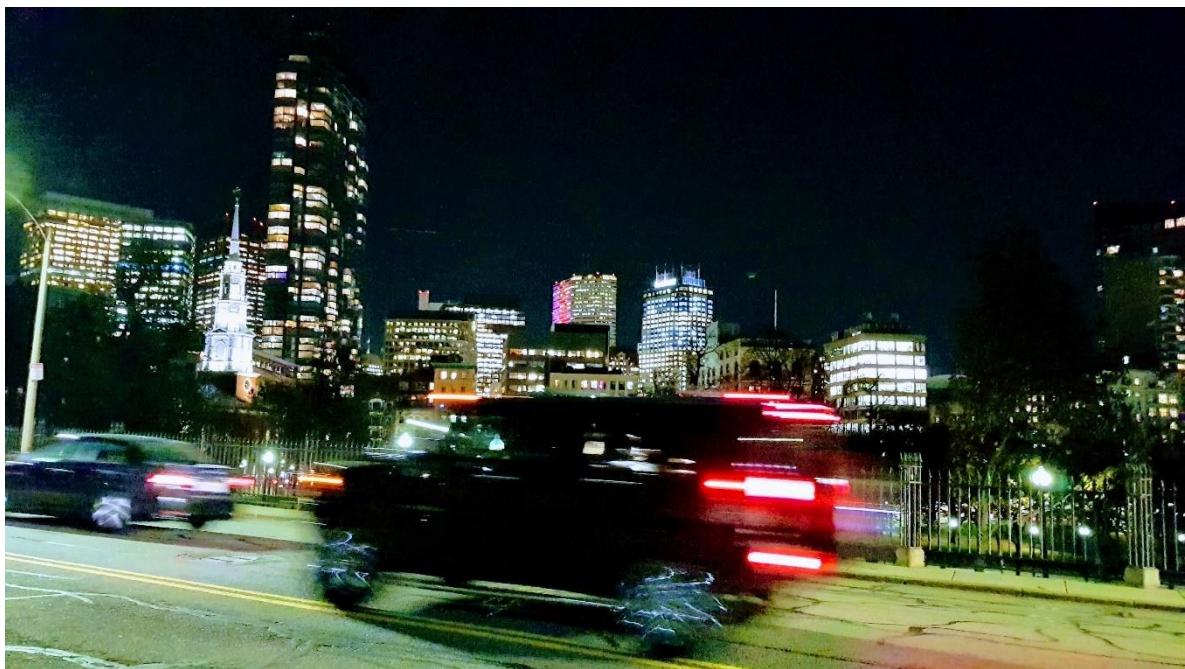
The campus in Hungary, we can see the yellow color produced by the sun rays bouncing in the white wall



My view in College Station, different colors of the sky



Boston, MA, two weeks ago. Pink light projected onto a building



Same building watched from afar (in the middle)

### Boxes exercise

We explored lighting by making a light box, a box that only allowed certain amount of light to enter. It was a challenge to design how much of light and from where to make pass through.

Box 1



This first box displayed one part half yellow half blue, another violet and another orange.

Box 2





The second box had a stained-glass feeling. I tried to have a cathedral looked, also using the Islamic mosaic idea and simple shapes. It has blue, green, yellow and violet, two color complements.

### Final Box

For this final project I got inspiration from pictures I took in Israel, I wanted to have an outdoor feel inside the box and a peaceful and quiet house and yard (the first one though is the game Horizon Zero Dawn).





Draft for the colors

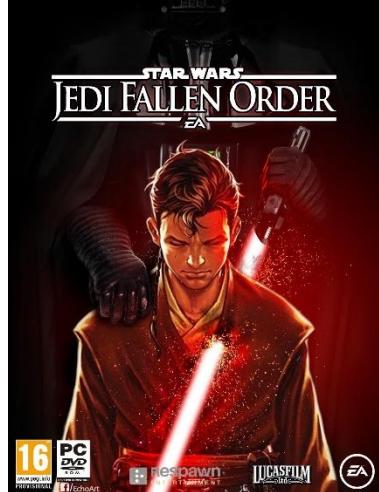
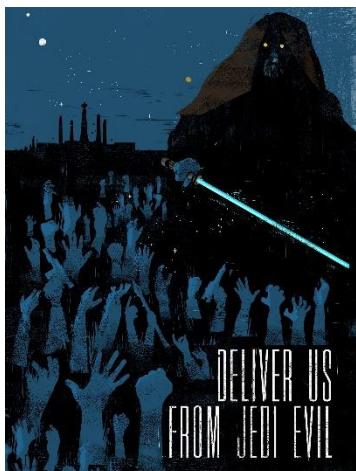


Final product

As you can see I couldn't achieve the colors I wanted because, it was very difficult because this box was much bigger than the others so the amount of light needed was more and I didn't allow much light to enter because I wanted it go to specific parts.

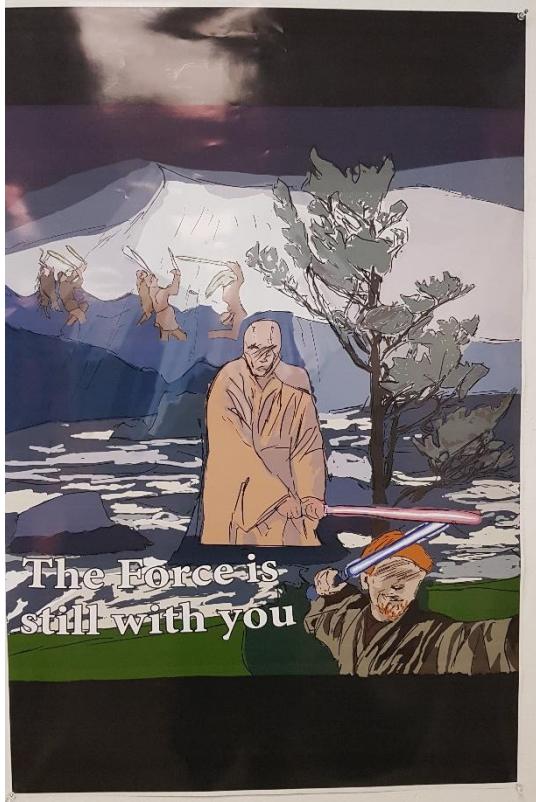
## Poster

Our final project was an exploration of the relation between color and text by making a poster. I decided to do a propaganda for the Star Wars universe in the era between episodes III and IV after Order 66 was launched (that started the hunting of the Jedi) and is a memorial for the Jedi that fought on the Clone Wars. This were some references:





Photography by Jay Moore in the Cannon Beach



Final product. I made a 36"x24" poster using digital painting in Photoshop. I tried to do the letters myself but they didn't look very good, it was difficult to choose the right color and font and it was particularly challenging since it was our first approach to text in the semester

PD: Many of the images were extracted from the internet and are not my own creation.