

Independent Project

Research title - How we perceive colour and light and the manipulative and emotional qualities demonstrated throughout the artistic industry?

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Intro

This Independent Project is a study of colour and light which aims to explore its foundations as well as its theoretical workings to examine the emotional and manipulative qualities demonstrated throughout the artistic industry of light. Within this essay I will be investigating within the foundations of light as well as the theoretical elements of colour and light. I will also be investigating into the practical usage of colour and light within art, and how emotion and manipulation interweave within the concept artistic working pieces. Ultimately my goal is to demonstrate the relationship between emotion and manipulation and its grasp over the spectral hue within both art as well as within theory.

It is described by Tim Armstrong within a practical approach to colour theory that,

Light is composed of a multitude of vibrational energies referred to as the electromagnetic spectrum, this light is capable of emitting countless wavelengths that are achieving high velocities and are often rendered invisible to the naked eye (Armstrong, 1991, p. 4).

Although, there does appear to be some wavelengths of light that are visible as documented by (Armstrong 1991), to which he proclaims that natural white light is composed of a mixture of visible wavelengths, that then travel at varying speeds to accommodate to the visual receptors within our retina. (Armstrong, 1991, p.4) In addition, according to Luigina De Grandis, the human eye perceives only those wavelengths between 380 mμ (Violet colour) and 780 mμ (Red colour) (Grandis, 1986, p. 11) Armstrong would later discuss how these wavelengths of light would then achieve contact with a multitude of surfaces and re-bound into the two cellular receptors within our retina, thus allowing us to perceive light as well as colour throughout our surroundings. In addition to this Armstrong (1991) also describes the numerous surface colourations that are both capable of reflecting and absorbing the wavelengths of light and how it may be perceived through the two cellular receptors within the retina.

This notion of colour absorption is also prominent within the written literature of Richard L. Gregory, to which he describes the additive and subtractive qualities of pigments within printing. (Gregory, 2015, p. 128). This Absorption and reflection of light would then be seen as a fundamental element in the perception of colour, allowing for the two cellular receptors situated within the retina to accurately perceive both the surroundings as well as the perception of objects. Additionally exploring within these principles of the reflection and absorption of light within the perception of objects, was the colour-based artist and researcher Hella Jongerius, who sought out to demonstrate the different tonal qualities achievable throughout a singular colouration and the use of the principles of light perceived throughout the human retina. (See figure 6.)

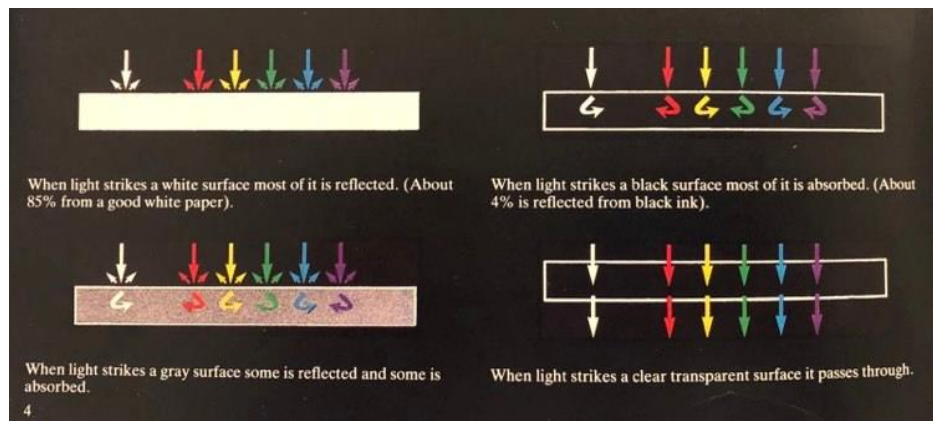


Fig 1

Situated within the retina, there are two sets of cellular receptors categorized into two groups: rods and cones, each one responding to different functionalities within the process of perceiving colour and light.

The functionality of rods within our cellular lens is to simply respond to colourless vision within dim lighting situations, where the purpose of cones is to respond to harsher levels of light and are responsible for our perception of colour (Armstrong, 1991, p. 4)

Described scientifically by Armstrong, this notion of colour perception is now well known throughout both the scientific and artistic community and demonstrates elements influenced by the theoretical workings of Sir Isaac Newton (2000).

This now leads to Newton's (2000) prism experiment (see fig .2). The prism experiment was an exploration into natural white light and how it can be easily manipulated, in order to peel back the outer surface on the constructs of light and delve into the possibilities beyond. This experiment was achieved through the positioning of sunlight through a series of slits directed towards a singular triangular glass prism, thus refracting the light into a multitude of angular colourations creating a light spectrum. Ultimately this led newton to develop the wave theory of light.



Fig 2

This experiment actively demonstrated the creation and visualization of the colour spectrum that Newton intended within the use of natural white light. "Progressing from red to orange, yellow, green, blue, indigo and violet" (Bluhm and Lippincott, 2000, p. 46).

Alongside this experimental discovery Newton was also able to define the rules of refraction demonstrating that "The shorter the wave, the greater the deviation (refraction), the longer the wave, the smaller the deviation" (Grandis, 1986, p. 12) This is discussed in further detail by Luigina De Grandis within her novelisation Theory and use of colour. Unbeknownst to Newton, his theoretical theory of light and colour would then later fuel the theoretical minds of countless successors within a multitude of fields, demonstrating that there are still unanswered questions on the theory of light and colour, thus it is still within a state of flux.

The sequence of colouration presented within Newtons (2000) prism experiment may appear familiar as it is a sequence that is often seen within the naturally occurring rainbow which use the same principles discussed in the workings of Newton (2000). These theoretical notions put forward by Newton would then later become common knowledge within the societal economy, branching outward across a multitude of fields as well as becoming a key element within the artistic world. Thus paving the way for theoretical thinking within colour and light and how it is perceived and integrated successfully within the workings of the artistic community.

The theoretical workings put forwards by Newton would then lead toward the use of colour manipulation within art, affectively altering the perception of the viewer both emotionally as well as implementing an essence of practicality and purpose within the use of the space throughout. However, this use of manipulation within the work may differ, this can be dependent on the on the context displayed throughout the working piece as well as how the viewer may choose to interpret the work through their own unique perspective.

Thus, an individual's perspective on the matter can head both positive and negative results, as it may allow room for endless interpretations of the work, but it can also restrict the viewer from the work's intended purpose. Rapid changes within the mental psyche can also be an aspect to consider when it comes to the perception and understanding of a visual working piece through the use of colour. For example, it is discussed within Mike Wellins Story telling through animation, how through the effect of one's emotional and physical state, the perception and understanding of colour can differ, this can be seen subtly or overtly. (Wellins, 2005, p. 128)

This actively demonstrates the grasp colour and light have over both an individual's emotional state as well as their perspective on the matter and how it may differ from the outlook of others, thus proving that light and colour although used as a manipulative tool, can also then become redundant as it may

not head the intended result throughout the presentation of the work. Ultimately this is what leads towards the theory of tying colour manipulation with emotion. Therefore, this use of emotional manipulation within the art will be investigated further within the practical use of light and colour throughout the artistic industry.

Therefore, our perceptions of colour and light can then be manipulated through the use of artistic workings and demonstrate different qualities of tonal colouration and emit an essence of intent toward the viewer. This intent would then allow the artistic workers to implement their own unique qualities within their work, whether it be cultural, religious or something that they hold dear. This form of working can be referred to as storytelling, which implements a form experimentation within the visualization of the work as well as providing purpose through the use of strong emotional beliefs within colour and light. This use of storytelling can then resonate with viewers, altering their perceptions of the work and allowing them to input their own emotional and physical responses based on the principles of light and colour demonstrated within Newtons (2000) prism experiment.

Alternatively theorising as well as attempting to contradict the theoretical workings of Newtons (2000) prism experiment, Sir Johann Wolfgang Von Goethe (2014) sought out to explore beyond the boundaries of the spectral lens and how we can visualise the world through a glass prism. The foundations of this theoretical thinking began through the exploration into Newton, who 100 years prior developed his own theoretical workings on the principles of colour and discovered how white light is composed of a vast colour spectrum invisible to the naked eye. It is also said that in particular Goethe began to research into a vast verity of ancient theories in order to understand the depth and meaning of colour. “The primordial” emergence of color through the interaction of light and darkness” (Serov, 2019, p. 203) This then led to Goethe’s exploration within the constructs of the glass prism, to which he discovered something truly remarkable through gazing within the glass prism and visualising the darker and the lighter tones of the word. Goethe was astonished to discover that when held to his window, the glass prism would only demonstrate a series of colourations upon the darker borders of the window frame, to which the dark meets the light. This intrigued Goethe, and

along with his obsession to discover the truth behind the foundations of light and colour, his experimentation within the boundary spectrum between the light and the dark began.

Similar to Newton's idea that there is a fixed sequence within colour Goethe would later go on to say that "There seems to be some laws governing colour" (Sallstrom, 2014). However, these laws were approached differently by Newton even though they both used a prism to explore light.

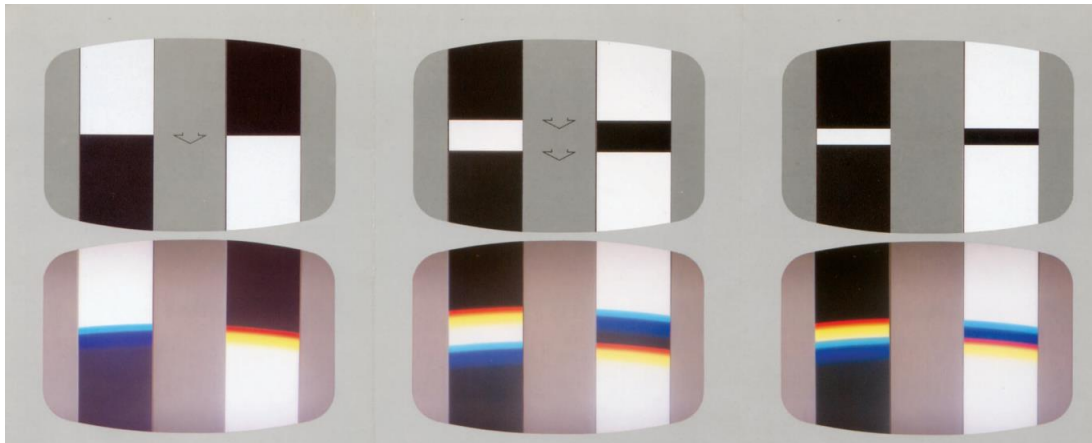


Fig 3

Through overlaying the prism on top of a black and white tonal imagery as seen above, Goethe began to carefully angle the prism both vertically and horizontally thus resulting in the visualisation of the boundary spectrum (see fig .3). These two spectrums are comprised both equally of blue tonal colourations and yellow tonal colourations, both visible between the borders of light and dark that form the elements of the prismatic spectrum. According to Sallstrom (2014) the colour sequence of the spectrum can vary from "white, white yellow, orange and red to black, alternatively from black via blue violet and turquoise to white" (Sallstrom, 2014). This sequence of colouration can be seen within the image situated below of the twelve-pointed colour star, derived from the mind of Sir Johannes Itten and his exploration within the colour spectrum. (See fig .4). These sequences of tonal colouration can then be overlayed on top of one another to create a series of new boundary spectrum to which the borders of light and dark combine, as Goethe will discover. The foundations demonstrated throughout this exploration into the boundary spectrum, would then produce a series of new principles within the use light and colour, to which such artists individuals as Adela Aneda would

use them to her advantage within the creation of her visually stunning sensory light installations. (See fig. 8).



Fig 4

The overlapping of these two spectrums allowed Goethe to visualise the spectral colouration between the boundaries to which the “red meets dark blue and results in a spectrum with purple between yellow and turquoise” (Sallstrom, 2014). Alternatively, the opposing spectrum is a combination of both the yellow and the turquoise which form a spectrum with green between the red and the dark blue. (Sallstrom, 2014).

These two combinations of spectral colour would then play a major role within the visualization of the world for Goethe, as well as being the foundations for the four basic prismatic spectrums.

The first two of the four basic prismatic spectrum are often referred to as the complementary and the boundary spectrums. These two spectrums demonstrate independently the yellow and the blue tonal colourations that were present within the experimental workings of Goethe, and his use of the glass

prisms. His findings mirrored what artists were saying about colour at that particular time, namely that some colours were warm and others cold. (Sallstrom, 2014). It was then later theorised and explored by Itten, that when two separate rooms were painted using the two tonal colourations of blue and red there was slight difference in the subjective temperatures, thus providing a sensation of the hot and the cold. (Itten, 1970 p. 45). There is a further in-depth exploration of the warmer and colder tonal colourations within the literature of Itten and his novelisation *Itten: The Elements of Colour*. The artistic working of Angela Bulloch also follows these concepts of tonal colouration, as visually seen within her series of lighting fixtures and her experimentation within the colder and warmer tones. (see fig .8

Typically placed within these two categories, both warmer and colder tones are the main basis of colour and are typically used as a form of categorization for various colourations. These two categories are then split up into two groups, demonstrating stronger tonal colourations within the warmer tones.

This demonstration of the warmer and the colder tones and the notion of the subjective sensation throughout, conclusively demonstrates the effectiveness within the power of suggestion and how it can affect the perception of a person, ultimately linking with their emotions. Unlike Itten, Goethe did not link his theory of colour perception with either emotion or the use of manipulation, however his findings would provide the base principles to which others may construct their own theoretical workings upon, perhaps only then aspects of emotion and manipulation can be seen throughout the use of the spectral hues. These emotional and manipulative aspects will undoubtedly provide an individual with an essence of superiority and control over others, whether it be throughout the theoretical or artistic worlds. This ultimately notes the question of whether this is a positive or a negative aspect to govern? These findings will be touched upon later within the text.

Unbeknownst to Goethe the two spectral hues previously theorised, would later give rise to colour theory, that then became common practice within the foundations of both art and culture, allowing

space for experimentation within the use of colour and light and how it is perceived throughout the world. Alternative to the two spectrums of colour and light are the elementary spectrums, these spectrums are a combination of both the boundary and complementary spectrums resulting in the creation of two new tonal colourations between the light and dark. Referred to as simply the Newtonian spectrum, this sequence of colouration begins “via the red, green and blue violet” (Sallstrom, 2014).

Alternative to this is what is known as the inverted spectrum that demonstrates an inverted sequence of colouration. This spectral sequence is comprised of “The yellow, purple and turquoise” (Sallstrom, 2014). Evidently these are all the four types of spectrums that constitute all possible colours attainable by the spectral modification of light. (Sallstrom, 2014). Therefore, the perception of light and colour according to Goethe, is based on the foundations as well as the positioning of these four spectrums, individually working in harmony with one another to emit the spectral colourations of light that are often seen governing the surroundings of the world. Although not to completely disregard the theory of light put forward by Newton, it struck Goethe that perhaps Newton must have missed some key elements within the perception of colour. “Namely the importance of both the light and the darkness” (Sallstrom, 2014). Goethe would later go onto explore further within the foundations of colour, discovering the importance of contrast between the light and the dark. “It is not fair to say that colour is in light, rather that it is created between light” (Sallstrom, 2014).

In essence the findings of Goethe alongside the previous findings of Newton, allowed for the exploration within colour theory to be possible, providing aspects to which emotional ties can be used as a way of governing the decision-making skills of countless people. In particular, artistic individuals.

Similar to Newton, Goethe would then seemingly go on to become one of the key figures to implement his own hypothesis of the principles behind the use of light and colour, as his experimental findings are often referenced within a series of theoretical literature based on the principles derived

from the minds of both Goethe and Newton. Thus, inspiring a new generation of theoretical thinkers to delve within the principles of light and colour and produce their own series experimental hypotheses based on the principles presented. This will now undoubtedly lead towards the exploration within an alternate hypothesis based on the theory of colour mixture and how they eye may perceive these combined colourations.

Solidifying some of the principles of colour theory, was the scientific and theoretical thinker Sir Thomas Young, who sought out the discovery of new hypotheses behind the constructs of light and colour and to demonstrate the use of colour mixture and its effect on the retina. Using similar principles put in place by his competitors at the time Newton and Goethe, Young began to explore within the boundaries of light and colour and attempted to produce an alternate outcome that would ultimately alter the methods of colour perception, as well as demonstrate the biological capabilities of the retina.

Young began his experimental workings through the exploration within colour mixture (see fig .5), to which he attempted to demonstrate the spectral hues that could be produced through the mixture of three coloured light sources. These where the blue, yellow, and red. Young later changed these to the Red, Green, and violet that is typically used within the process of colour theory today. Influenced by the theoretical workings put in place by Young, it is demonstrated withing Armstrong's novelisation how he would seemingly use the principles demonstrated above and begin an investigation of his own, delving into themes colour mixture using a variety of different methods in order to produce the visualization of the colour mixture chart. Experimenting within the concept of coloured light , Young began to overlap each one of these three light sources, resulting in combination as seen in the image below.



Fig 5

From this experimentation within the three primary-coloured light sources, Young deduced that although spread equally across all forms of the colour spectrum, when combined these three primary colourations were then capable of producing a variety of new spectral hues that varied through the adjustment of “the relative intensities” (Gregory, 2015, p. 125. Upon the mixture of the three different intensities of light, Young distinguished that there was a slight deviation upon the mixture of each colouration, demonstrating the effect of the different mixtures of light that are responsible for the creation of colour. This use of colour mixture can also be seen throughout the artistic industry, primarily withing the use of pigmentation. The deviation between the colour mixtures can be seen clearly above, as the green meets the blue forming a cyan, in comparison to its opposite to which green meets the red which forms a yellow colouration of light.

Although demonstrated here within a theoretical format, the use of colour mixture has always been a prominent feature within the artistic industry, demonstrating that colour mixture began as a practical skill to which artists intended to demonstrate the numerous tonal qualities possible through the manipulation of coloured pigments. This use of manipulation within art can also be utilised as a strong source of empowerment, thus instilling confidence within the workings of the artists and how they are

capable of controlling the elements around them. This could also be relevant within the presentation of artistic work, as well as how the artists would attempt to manipulate the perceptions of the viewer, primarily through the use of their strong emotional ties or personal experiences. This sense of strong emotion and manipulation of art can also be linked with the perception of colour and light, as through the combination of these two aspects, the viewer can be made to correlate a particular emotion and or personal memory within the visualisation of the tonal colouration thus implementing a functional concept to the work. It is said within the written novel the *Acta Psychologica* that “Colours are linked to emotional concepts” (*Acta Psychologica*, 1935, p. 1). In essence this manipulation of the viewer through the use colour and light can demonstrate aspects that will benefit both artist and viewer through providing memorable and emotional aspects that the viewer won’t soon forget. However, this concept of artistic manipulation does now note the question of Why would artists use this tactic within their work? This will be explored within the conclusion of the text.

It is said by Gregory that,

When a painter mixes yellow and blue to produce green, he or she is not mixing lights; but is mixing the total spectrum of colours, minus the colours absorbed by the pigments (Gregory, 2015, p. 124)

These are the base principles of colour mixing that are discussed by young within his theoretical workings, to which he would then go into further investigation, delving into the perception of these spectral hues and there corresponding cellular receptors.

Alongside this investigation into the combination of colour, Young also sought out to demonstrate the relationship between the three main principal colourations and the cellular receptors situated within the human retina. He would then go into a deep investigation around this subject area, delving into such matters as the quantity of sensitive receptor cells that are capable of perceiving colour through the use of light. Throughout his investigation, young began to question the capabilities of the human retina as well as the multitude of sensitive receptor cells that are capable of the perception of colour

and light. From this investigation within the retina, Young would then come to a thrilling conclusion that there could not possibly be a multitude of cellular receptors that are sensitive to every separable form of colouration. This was an impossibility; therefore, he would consider the number of receptor cells to be limited “For instance to the principal colours, red, yellow and blue. (Gregory, 2015, p.122). This is where the concept for Youngs exploration within the mixture of the principal colours began. Young would later take these findings and proclaim that these were the only three cellular receptors situated within the retina that perceive all forms of colouration. (Gregory, 2015, p.122) All other forms of the cellular receptors do not exist, for example the orange and the yellow. However young would suggest that all forms of colouration are simply an amalgamation of these three-principal colouration. For example, rather than having its own cellular receptor sensitive to the colour yellow, it is simply the combination of the red and green receptors that for the sensation of yellow. “This is a presently accepted theory” (Gregory, 2015, p.122.

Leading onward from the realm of theoretical thinking, the use of light and colour within a practical environment have played a major role in how art has and will be perceived as well as understood within the deeper foundations of its constructs. In essence colour and light can be used to tell a story through the visual means, demonstrating aspects of emotion and or culture throughout the working piece. This was previously mentioned above, throughout the theoretical workings of Newton, Goethe and young.

Demonstrated below are a series of artistic workers who primarily work within the boundaries of light and colour and who use the theoretical principles mentioned within the above text in the development of their work. The intention is to demonstrate the different approaches to the use of light and colour within a series of artistic workings.

Situated below is the work of Hella Jongierus, who was previously mentioned in the above text and how her work was primarily focusing on the tonal colourations and how light effects the surfaces. Her

large bulbous pieces presented below (see fig 6) are a series of ceramic forms that feature a series of angular surfaces, which demonstrate different tonal qualities to which the perception of the piece can be visualised from a multitude of perspectives. Demonstrating efficient use of the light and colour within her work Jongierus seeks to explore within the boundaries of colour and demonstrate the multitude of possibilities within the perception of colour.

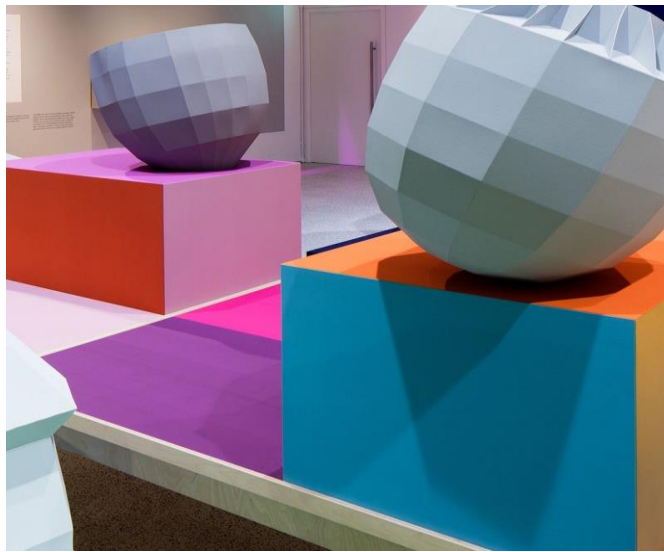


Fig 6

The work of Adela Andea (see fig .7) focuses on the combination of both colour and light to form a large-scale sensory exhibition (Relating to sensation or the physical senses; transmitted or perceived by the senses). The intention of this exhibition is the experimentation and the manipulation of the senses through colour and light. Primarily focused on the visual senses, her work demonstrates aspects of hypnotic transitions of colour that appear to meld and reform within one another, not

allowing the eyes to fixate on a singular area of the work. Highly textured, her combination of both the light and colour demonstrate aspects of unfamiliarity appearing almost alienated (Experiencing or inducing feelings of isolation or estrangement) from the rest of the world, as if this piece has now transcended beyond human recognition.



Fig 7

This is an example of how colour, although prominent within our world can demonstrate aspects of uneasiness as well demonstrate the possibilities beyond the limitations of colour. It is the duty of an artistic individual to explore these limitations and push past the boundaries to which light and colour can be both utilized and visualised.

Taking an alternative approach to colour, the work of the artist Angela Bulloch (see fig .8) features the use of large scale pixelated cubed forms that differ in colouration as well as size. Ranging anywhere from 4-20 panels of colour each, Angela carefully and precisely places each tonal pigment upon the cubed form and creates a sense of calm as well as trust. Thus, evoking emotion from the viewer and drawing them into the world she has created. Demonstrating a fascination with both pattern and ruling (Discussed below) Angela Bulloch seeks to demonstrate the creative territory

between both the mathematical and aesthetic aspects of colouration. This is visually seen within her pixelated block forms.

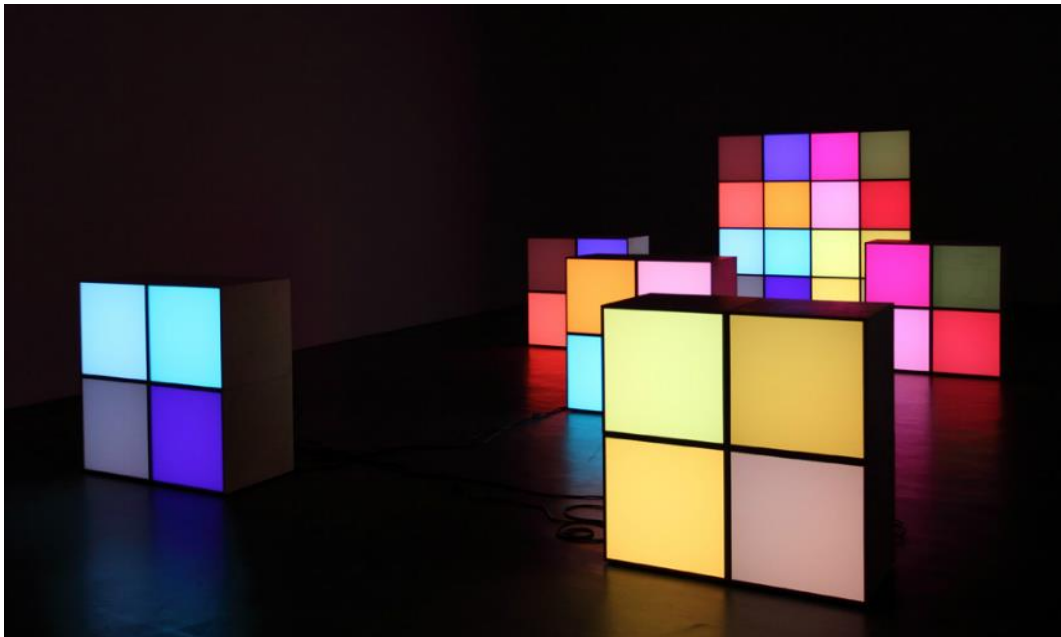


Fig 8

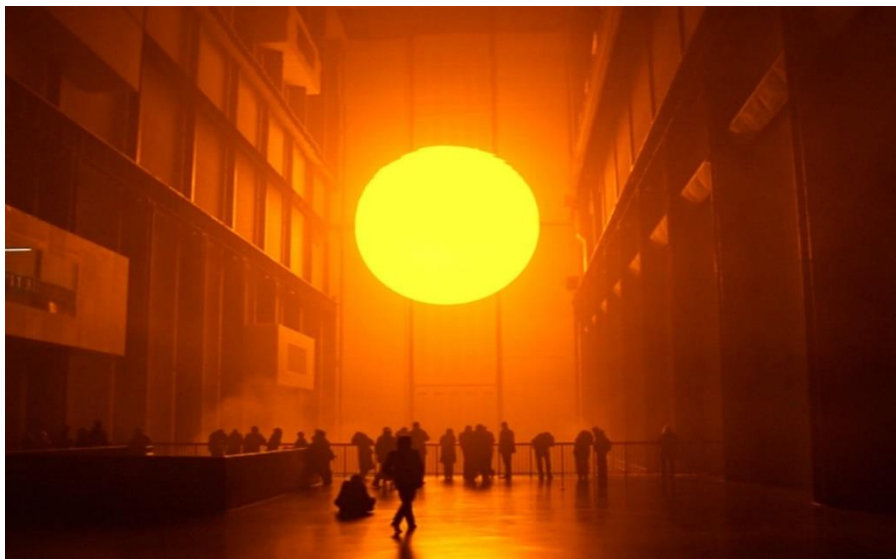
Minimalistic yet effective, her use of colour within these pixelated forms clearly demonstrates the effectiveness of colour and how it can be utilised alongside mathematical aesthetics to form a range of cohesive working pieces

Demonstrating a wealth of exploration into both tonal colourations as well as mirrored surfaces, the work of Olafur Ellison (see fig .6) demonstrates aspects of reflective qualities that span outwards toward the surrounding surfaces, thus filling the room with colour and pattern. Typically working across a multitude of mediums, Olafur primarily produces a collection of large, towering pieces that border on both the sculptural as well as the highly functional aspects of objects. This is clearly seen throughout his collection of reflective kinetic light sculptures, to which various coloured patterns were cast onto the interior of the building. Highly decorative, each one of his exhibited spaces demonstrates the use of a single colouration that has been spread across the room and reaches into the far corners of the space. Similar to the sensory exhibition this use of colour provides the space with an unfamiliarity

as well as a sense of alienated emptiness. One prime example of this use of colour is his suspended sun piece that was created as a part of the weather project.

The weather project

Within this space, features a large spherical lighting piece (see fig 9) that was created to represent the warm glow of the burnt orange sun. This piece as previously mentioned is capable of casting its warm hue across the entirety of the space, demonstrating an explosion of colour and creating a sense of



serenity across

Fig 9

the exhibition. Effectively used, this exhibition successfully demonstrated the use of colour within a space and how individuals can be easily manipulated by the use of colour.

Strongly tied with emotion, colour as a concept is capable of grasping onto an individual's psyche and demonstrates aspects of manipulation that overall affect the way one thinks and feels at that particular time. This is clearly seen within the work of the artists above as their use of strong colourations and tonal manipulation were made to evoke an emotional response from the viewer. In essence colour has power. This use of colour is prominently seen across a multitude of platforms, ranging anywhere from the highly visual work of artists to the colourations of our favourite branding logos.

As a modern society, our fixation upon visual logos is heavily influenced by clever marketing strategies that use the power of colour to their advantage. Thus, gaining a sense of power and manipulation over their targeted audience. This is done through precise decisions and careful planning in order to portray the correct and most effective use of colour for both their product and branding. However, this is not a simple task as there are many factors to include when it comes to the use of colour, for example the use of colour theory as well as the use of warmer and colder colourations. The intentions of these branding companies it to develop a series of colourations within their logos that as an individual would provoke you to associate a particular colour within the brand, thus luring you in with the use of colour theory and the emotional aspects that accompany.

In conclusion to what has been investigated within this text, It has come to my attention that the use of emotion and manipulation through the use of colour and light is heavily prominent within the artistic industry, using principles derived from the theoretical and the fundamental aspects of the spectral hue. Therefore, I can only conclude that Artists, deliberately use both emotion and manipulation within colour and light throughout their artistic working, in order to provoke a sense of emotion from the viewer. Ultimately this will benefit their workings, providing their artistic work with both a purpose as well as demonstrating the affects of colour perception through emotion and manipulation.

Armstrong, T. (1991) *Colour perception. A practical approach to colour theory.* Italy: Tarquin Publications.

Acta psychologia (1935) Austria: Elsevier B.V.

Bluhm, A. and Lippincott, L. (2000) *Light. The industrial age 1750-1900*. Art Science, technology & Society. London: Thames & Hudson.

Grandis, L. (1986) *Theory and use of colour*. Dorset: Blandford press.

Gregory, L.R, (2015) *Eye and brain: The psychology of seeing*. 5th edn. New jersey: Princeton University press.

Itten, J. (2003) *Itten: The Elements of Colour*. Germany: John Wiley & Sons, Inc.

Sallstrom, P. (2014) A lecture presenting J.W Goethe's approach to colour: [video]. Available at: Goethe's Theory of Colours, Part 1 - How it all started – YouTube (Accessed 9 November 2021).

Serov, N.V, (2019) 'Conceptualizing the Predicates of the Goethe–Newton Controversy about Colour', *Automatic documentation and mathematical linguistics*, 53(4), pp. 203- 215 Available at: Conceptualizing the Predicates of the Goethe–Newton Controversy about Color | SpringerLink (uwtsd.ac.uk) (Accessed: 21 November 2021)

Wellins, M. (2005) *Storytelling through animation*. Massachusetts: Charles River Media, Inc.