COLOUR

A Brief history of our modern understanding of colour and it’s practical applications in affecting the mood & choices of modern consumers.

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Abstract

In this essay I explore how colour can be used to influence decisions and mood in our everyday lives, including its use in health and retail. I begin in chapter 1 with an exploration of the origins of our understanding of colour and its physical and psychological effects on us. I then conduct a review of literature in this field including analysis of studies and reports as presented in chapter 2. In chapter 3, Primary research conducted also gives an insight into the approach of contemporary designers to the use of colour, provided in figure 13, and explore how an understanding of colour relates to my work.

To gain a measure of understanding of why colour has such an impact on our lives it is important to explore the history of our understanding of colour, so to this end I look at some key moments in our history and the people involved in the exploration of the properties of colour.

I also explore the methods used by business to affect our experience, decisions and purchasing choices and the reasons behind why those methods are so successful.
Introduction

There are so many ways colour has influence on our daily lives and an equal number of research studies to explain what colours have which effect on a particular type of person, and make suggestions as to how this can be used to increase sales. But where did this knowledge come from? In this essay I look at the key figures through history who have furthered our knowledge and understanding of colour such as Aristotle, Isaac Newton, Johann Wolfgang von Goethe, Johannes Itten, Josef Albers and Angela Wright.

Our awareness of colour goes back a long time, there is evidence of shell beads, bits of ochre, and ostrich shells carved with geometric designs dating from about 70,000 to 100,000 years ago. The cave paintings at El Castillo on the Cantabrian sea coast of Spain, and the cave paintings of Chauvet in France which are believed to be at least 40,800 years old and 37,000 years old respectively. They are a tangible example of someone making a conscious decision to grind differing pigments (red ocher, umber) and things like charcoal into a paste or more watery substance resembling paint. This was then applied either by brushing on or blowing through a hollowed out bone, an early airbrushing technique, often over things like a hand or twigs to create an image.

What was the purpose of these early artists attempts, and do we still use colour to communicate to one another? In his introduction to the book Beginner’s Guide to Colour Psychology by Angela Wright, Chris McManus states “A world without colour is not just a drab and dreary world, it is also a dangerous, unpredictable world in which it is easy to be poisoned.” (McManus, C. 2017) by which he explains that colour created learned associations with things like danger. Or, it could be as simple as “We were here” or “Look what I saw today”! Whatever the reasons, it is clear that from probably our earliest ancestors, humans used colour to express themselves and as a way of communicating with others.

This essay aims to show the historical progression of our understanding of colour and detail how it has evolved into a key tool in how we interact with our world. With it, I offer an insight into the effects colour has on our choices and perhaps create a greater awareness of how we can use it to our advantage as well as increase the knowledge of how it is being used to influence us.
Chapter 1

Early understanding of colour.

Our understanding of colour in a more modern sense has been expanded by a number of key people through our history, but you can attribute some of the earliest advances to Aristotle, the Greek philosopher, who recorded his observations of the colours in the world around him. This led to his theory of colours and their origins. Aristotle believed in Blue & Yellow being the two primary colours relating as they do to life’s polarities: Yellow from the sun and daylight, Blue from the moon and night time. He also associated colours with the four elements: fire, water, earth and air. He observed the way light changes throughout the day, and from this study, developed a linear colour system that ranged from the white light of day through to the black of night.

Aristotle’s linear colour system above shows how he viewed the colours of the day in a progression from morning to night time. It shows all the colours he recorded including the unexpected addition of green which can often be seen at dusk.

Black and white, included on Aristotle’s scale might seem unusual to modern understanding but colour can be perceived by us where none actually exists as is shown in the example in figure 3. Waves of black lines on a white background cause our brains to see colour flashes between black & white lines.
However strange Aristotle’s ideas may seem to our modern sensibilities, and with the benefit of nearly two and a half thousand years of further research, his observations lead to a greatly accepted paradigm and set the groundwork for studies by people such as Sir Isaac Newton, Johannes Itten and Johann Wolfgang Von Goethe.

Some of Aristotle’s contemporaries such as Empedokles compared the eye to a lamp radiating light: “As the lamp radiates rays of light, so does the eye, which contains eternal fire shut up within it” (Benson J.L. 2000)

This assumed that we see external objects by virtue of a fire-like emanation from the eye. An early supporter of this theory was the Pythagorean, Alcmaeon of Croton (5th century B.C.), who gave as evidence the flashes of light and color seen when the eye is struck. However, it is refuted by Aristotle who argued that if this was the case then our night vision would be as good as our day vision.

Aristotle’s theories certainly didn’t stand the test of time, although traces did remain up until the 18th century. Though some of Aristotole’s suggestions were based on what would over time be shown to be accurate observations. For instance, while some of his suggestions as to the origin of certain colours may not have been wholly accurate he did observe that colour was altered, changed or mixed when it came in contact with others through reflection or transmittance. So a white wall for instance, would take on a reddish tint or hue if a red object were to be placed next to it. Likewise for other colours that, when mixed, would result in a tertiary colour tint. (Ibid)

This is an observation which is still very much observed today and is often used to guide colour choice in everything from clothing to architecture. What clothes to wear with an outfit, what colour to paint a wall that gets no direct sunlight.

**Newton**

When Sir Isaac Newton (1642 - 1727) was elected Lucasian Professor of Mathematics in 1669 he chose to begin his lectures not on mathematics, but on his “New theory of light and colours”, a subject he had been developing since 1668 and first wrote about in 1672, theories and experiments that would form the basis for a new understanding of the properties of light.

Newton’s experiments showed that, rather than colour being a product of the four elements Earth, Wind, Fire and Water, as proposed by Aristotle, colour was actually a property of light itself. His experiments showed that as light was passed through a refraction device such as a soap bubble, glass or his favorite instrument, the glass prism, it was refracted at different angles into separate “Colourific Rays”. His critics’ arguments that the prism was actually colouring the light were addressed when Newton passed the refracted rays through a second prism showing that they returned to white light.

![Figure 4](image-url)
Guerlac writes: “The relation or "analogy," as he (Newton) calls it, between colors and the degree of refrangibility he described as "very precise and strict." Colors, Newton clearly recognized, have no extra-mental existence, but are internal sensations of our sensory apparatus evoked by the light from luminous or illuminated bodies.” (Guerlac, 1986, pp. 3-20)

Here I believe Guerlac is explaining how Newton believes there is no further meaning, property or effect of light other than the exact properties that can be deduced by scientific experiment, and that other implied, non-scientific effects have no relation to light itself.

Johann Wolfgang von Goethe, (1749 - 1832) widely recognised as Germany’s greatest poet, playwright, novelist and essayist – comparable to Shakespeare and Dante, didn’t entirely agree with a lot of what Newton had to say on light and colour.

**Johann Wolfgang Von Goethe**

In the preface to the First Edition of Goethe’s Theory of Colours (1840, Translated from German by Eastlake, Charles Lock), Goethe compares Newton’s works to be like a castle that has been revered for so long only because it has never been adequately challenged or taken. The great theory of Newton had been revered and recommended to school children for so long it had become an institution to be defended at all costs despite the fact that science has advanced since, and he recommended clearing away the old bastion to be replaced by newer scientific theories.

Having misinterpreted some of Newton’s experiments however, Goethe created his own version of Newton’s colour wheel based on his own experiments, seeking to derive laws of color harmony, ways of characterizing physiological colors (how colors affect us) and subjective visual phenomena in general. He studied after-images, colored shadows and complementary colors.

Figure 5
Goethe’s theories were not solely centered around the properties of colour in the Newtonian sense however: “Where Newton had viewed color as a physical problem, involving light striking objects and entering our eyes. Goethe realizes that the sensations of color reaching our brain are also shaped by our perception - by the mechanics of human vision and by the way our brains process information. Therefore, according to Goethe, what we see of an object depends upon the object, the lighting and our perception.” (Web exhibits.org. Author unknown.)

So where Newton’s breakthrough concerned the physical breakdown and properties of light, Goethe gave us the first insights into the human interaction with light, how we perceived it individually, the effect it had on us and in a more modern sense how it could be applied to create a desired effect among targeted groups such as would be found in the age of the consumer.

Our perception of colour relies on varying subjective conditions. For instance, in his text “Theory of colours” Goethe states that seen together, objects of a different colour can have a perceived effect on each other. A dark object appears smaller than a bright one of the same size. Let a white disk be placed on a black ground, and a black disk on a white ground, both being exactly similar in size; let them be seen together at some distance, and we shall pronounce the last to be about a fifth part smaller than the other. If the black circle be made larger by so much, they will appear equal.” (Goethe, 1970)

Here Goethe explains an example of perceptual phenomenon that can trick the eye into seeing something other than what the facts are showing. In a similar way, Josef Albers explains our perception of colour as I show later in this essay in Figure 7.

Chapter 2

Modern refinement of theories.

Johannes Itten

Our more modern understanding of colour & its practical applications in the area of consumer psychology began to be more fully understood in the early 20th century with the explorations of artists such as Johannes Itten and Josef Albers, and the critical studies of people such as John Gage and Angela Wright.

The explorations of Itten on the nature of colour and its subjective meaning has informed our understanding and influenced artists throughout the 20th century. His approach to the subject involved a closer look at the artist or viewer and considered the impact of personality on the subject matter. It was this approach that set him both apart from, and at odds with his peers. (Ekperigin, N. 2000).

His book, the art of colour remains an influential text to this day in which he discusses his theories on colour contrasts as being a furthering of Adolf Hözel’s colour wheel and goes on to develop his own colour sphere (figure 6) which attempts to explain the relationship between colours and their contrasts.
Itten also believed strongly that colours had more than just physical properties and that they each had a physical and emotional resonance in the viewer. Itten explains: “Colors are forces, radiant energies that affect us positively or negatively, whether we are aware of it or not” (Itten, J 1970)

His studies in the Bauhaus led him to conclude that there were four distinct personality types which could be associated with distinct colour palettes. In an exercise during one of his classes at the Bauhaus, Itten required his students to paint their impression of the seasons through colour. The resulting works were both very different but still recognisable to each other. He was able to group the resulting works into 4 different colour palettes which he named after the seasons.

**Josef Albers**

Another artist who broke new ground in the area of understanding colour was Josef Albers who wrote: “Colour is the most relative medium in art” (Albers. 1963, Pg:8)

By this I believe he means that colour is not just a fixed value but depends entirely on the viewer’s perception, viewing condition, it’s placement with or near other colours and other variables that can affect a person’s perception of a colour.

Josef Albers book “Interaction of Colour” was probably the most in depth study of its time, of the relationship between colours themselves and of our perception of colours in differing situations and conditions. Though his work was not immediately praised by his peers it was to become essential reading by anyone with an interest in the field.
In his text Albers shows the interaction of colour and perception in an exercise similar to Goethe’s above (chapter 1, page 7).

“A colour has many faces, and 1 colour can be made to appear as 2 different colours. In the original design for the study here, horizontal dark blue & yellow stripes were on a flap which could be lifted to show that a vertical strip of ochre is the same colour at the top as it is at the bottom. Here it is almost unbelievable that the upper small and the lower small squares are part of the same stripe and are therefore the same colour. And no human eye is able to see both squares - alike.” (Albers. 1963, Pg:76)

![Figure 7](image)

Albers is proving von Goethe’s assertions that colour is not a fixed valued property but is subject to conditions and perception.
Through an explanation of two interesting phenomena, After Image and Optical Mixture, Albers tells how colours can be perceived as different even when placed in proximity to each other. For instance, the Impressionist painters would rarely use a green pigment to represent green but would instead place very small blobs of yellow & blue on the canvas and when viewed from a distance would be perceived as, or give the impression of, green. This technique was also favored by practitioners of Pointillism.

Two further experiments of Albers students show how the effect of Optical Mixing can be used in a practical sense, rather than just artistically, to alter our perception of colours in products, packaging or even promotional material.

The first experiment, Shown below, shows a depiction of a red brick wall. One version has the mortar between the bricks painted white, while the 2nd wall has the mortar painted black. The wall with the white mortar appears as though the red bricks are of a much brighter red and the black mortared wall is of a much darker shade of red.

The second experiment, Shown below, is a great example of the Bezold effect, named after a German Physicist and Meteorologist Wilhelm von Bezold, who was attempting to change the colour combinations of his rugs entirely by changing just one colour. (Albers, J. Interaction of Colour, 1963 Pg:33)
It shows a textile pattern with a rose coloured background with red shapes placed in the pattern. In one half of the textile the red shapes are bordered by black and in the other half they are bordered by white. The effect of bordering the shapes with white entirely brightens all the colours on the textile and is a perfect example of the Bezold effect and shows how the interrelationship of colours can affect our perception of them.

Figure 9

The subject is also expanded upon by Johannes Itten in his explanation of colour contrasts. Through his research he devised seven methodologies for coordinating colors utilizing the hue’s contrasting properties. These contrasts add other variations with respect to the intensity of the respective hues; i.e. contrasts may be obtained due to light, moderate, or dark value. (Itten, Karp. 1972)

These contrasting values are:

- The contrast of saturation
- The contrast of light and dark
- The contrast of extension
- The contrast of complements
- Simultaneous contrast
- The contrast of hue
- The contrast of hue - primaries
- The contrast of warm and cool

It is evident that the approach of both Itten and Albers is very similar, indeed both had a direct or close working relationship with one of the pioneers of this thinking Franz von Stuck, whose pupils included Wassily Kandinsky & Paul Klee. With Itten working alongside Paul Klee at the Bauhaus it was not unlikely that these theories would find a fertile ground.
Chapter 3

Contemporary applications of colour

The work of both Albers and Itten in explaining the effects of proximity, harmony and contrasts to affect our perception of colour provides a solid basis for our contemporary understanding and a grounding for the research done by people such as Angela Wright to expand our understanding of colour psychology and its uses in modern consumerism. This idea that colour has a physical & emotional effect on people forms the basis for modern marketing principles where colour is used to influence how consumers make their choices and what they feel about their experiences.

Research carried out by British researcher Angela Wright since the early 70’s took the prevailing paradigm a step further. Wright suggested that not only did colour have an emotional and physical effect on people that was influenced by more than just the main colours but differed depending on the hue or shade, and that this effect wasn’t just random but was in fact predictable. (Wright, A. 2003) This predictability would allow designers an effective tool in designing products & packaging aimed at specific markets.

Wright’s findings show that rather than the few major colours on the colour wheel having a specific effect, the effects can vary according to any one of the many hues of a colour and is specifically related to the intensity of a colour. So a low saturation blue would have certain level of response while a much higher saturated and intense blue would have another level of response altogether. (Wright. 2003)
A research study by Shun Yin Lam also shows that colour is effective in attracting certain types of customers as well as influencing their purchasing decisions. The section of infographic below shows how people react to each colour as well as the types of customer they can attract. (Shun Yin Lam. 2017) Consumers place appearance and colour above all other factors when shopping, with 85% of shoppers citing colour as their main reason for buying a product.

Figure 10
(The effects of a store environment on shopping behaviours: A critical review by Shun Yin Lam
The profit of colour by colour marketing group. The psychology of colour in marketing by June Campbell,
DirJournal.com & Colour Matters.com)
We can also have learned associations with colour, so that not only can we be naturally influenced by our reaction to a colour we can also be conditioned through environmental cues. For instance, red stop lights, emergency vehicles and teachers red pens teach us caution and danger. These trends can also carry over to our receptivity to consumer packaging and marketing messages.

Practical applications in design.

When we have come far in terms of marketing products & services in the last 200 years. When products were packaged and sold as commodities and not brands they were packaged in cloth or brown paper, there was no thought given to making packaging attractive to consumers. Now, almost every opportunity is taken to make use of advertising space and the promotion of a brand. I believe that the biggest tool in this never ending race is the use of colour, with over 600 billion dollars being spent globally on advertising in 2014. (Emarketer.com. 2017).

One example of colour being used in a positive fashion is Ryanair, who purchased new aircraft with a system built into the ceiling of the cabin that can be programed to emit any colour light based on whether the crew want the passengers soothed or energised, or even made to feel hungry.

Figure 11

Figure 12

To get the perspective of someone in the industry I interviewed Dr. Christine Mullan-Jensen, a psychologist for Spark Market Research, Dublin, about the importance of colour to a brand in today's marketplace. When dealing with one client in particular Spark did research on a range of colours to use on a product with a number of different price levels.

“We ranked different concepts in colours from Gold to Green, Blue & Red in order of their premium product to the standard one, with the more expensive product being the gold. So they were trying to guide the buying decision to the premium product.” (Mullen-Jenson, Dr. Christine. Interview on blog)

I believe this shows a very considered approach of using colour to increase the sales of a premium product over a less expensive one.

Consumers are also being “trained” to recognise value items or sale items through the use of colour in signage and even decor. The colour you paint your store can relax people and make them more likely to spend more time browsing, or the colour of the signage in a particular area can attract attention simply because people associate that colour palette with a good deal.
The relationship between consumer perception of quality and the food industry’s drive to satisfy consumer needs is complex and involves many different components. Emphasis is placed on perception at point of sale particularly the intrinsic quality cues of colour. (Direct, 2017, Abstract)

Color is ubiquitous and is a source of information. People make up their minds within 90 seconds of their initial interactions with either people or products. About 62-90 percent of the assessment is based on colors alone. So, prudent use of colors can contribute not only to differentiating products from competitors, but also to influencing moods and feelings – positively or negatively – and therefore, to attitude towards certain products. One can use colors to increase or decrease appetite, enhance mood, calm down customers, and, reduce perception of waiting time, among others. (Emeraldinsight.com, 2017)

I carried out some primary research to see if any of the lessons learned from my research were being employed in a practical sense by retailers. I observed a number of retailers in the Pavillions Shopping Centre, Swords, Co.Dublin, to see if any patterns emerged. The images taken in this research can be seen in index A.

The table below shows the Type of store, General colour palette, Lighting and General market.

<table>
<thead>
<tr>
<th>Store</th>
<th>Store type</th>
<th>Market</th>
<th>Lighting</th>
<th>Colour palette</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sostrene Green</td>
<td>Knick tack</td>
<td>Mid-Exclusive</td>
<td>Soft</td>
<td>Rich brown, Grey</td>
</tr>
<tr>
<td>Tiger</td>
<td>Knick tack</td>
<td>Low - Mid</td>
<td>Poor, spots</td>
<td>Grey, Yellow</td>
</tr>
<tr>
<td>Body Shop</td>
<td>Health</td>
<td>Mid - Upper</td>
<td>Soft</td>
<td>Green, Brown</td>
</tr>
<tr>
<td>Perfume Shop</td>
<td>Perfume</td>
<td>Mid</td>
<td>Bright</td>
<td>Black, Red</td>
</tr>
<tr>
<td>Style Club</td>
<td>Hair</td>
<td>Mid - Upper</td>
<td>Subdued</td>
<td>Bubblegum Pink, Yellow, B&amp;W</td>
</tr>
<tr>
<td>Nandos</td>
<td>Restaurant</td>
<td>Upper Mid</td>
<td>Dark</td>
<td>Grey, Wood, Brown</td>
</tr>
<tr>
<td>Butlers</td>
<td>Cafe</td>
<td>Mid</td>
<td>Warm, homely, spots</td>
<td>Red, White, Brown</td>
</tr>
<tr>
<td>SuperValuie</td>
<td>Supermarket</td>
<td>Mid</td>
<td>Subdued</td>
<td>Red, White, Brown</td>
</tr>
<tr>
<td>Chopped</td>
<td>Restaurant</td>
<td>Mid</td>
<td>Bright, spots, daylight</td>
<td>Green, Blue, Brown</td>
</tr>
<tr>
<td>Sabounitos</td>
<td>Restaurant</td>
<td>Mid</td>
<td>Bright</td>
<td>Orange, Brown, Grey, Blue</td>
</tr>
<tr>
<td>KFC</td>
<td>Restaurant</td>
<td>Budget</td>
<td>Subdued</td>
<td>Red, White</td>
</tr>
<tr>
<td>Gerard</td>
<td>Clothes</td>
<td>Mid - Upper Mid</td>
<td>Poor, Spots</td>
<td>Grey</td>
</tr>
<tr>
<td>Bests</td>
<td>Clothes</td>
<td>Upper</td>
<td>Subdued</td>
<td>Blue, Brown, Grey</td>
</tr>
<tr>
<td>Penneys</td>
<td>Clothes</td>
<td>Budget</td>
<td>Bright</td>
<td>Black, White, Silver</td>
</tr>
<tr>
<td>Tommy Hilfiger</td>
<td>Clothes</td>
<td>Upper</td>
<td>Even &amp; Spots</td>
<td>Brown, Grey</td>
</tr>
<tr>
<td>Schuh</td>
<td>Clothes</td>
<td>Mid - Upper Mid</td>
<td>Even</td>
<td>Green, White, Grey</td>
</tr>
<tr>
<td>Samsung</td>
<td>Tech</td>
<td>Upper</td>
<td>Subdued</td>
<td>Blue, White</td>
</tr>
<tr>
<td>CompuB</td>
<td>Tech</td>
<td>Upper</td>
<td>Soft</td>
<td>Brown, White, splash colour</td>
</tr>
<tr>
<td>Cassidy Travel</td>
<td>Travel</td>
<td>Mid - Upper</td>
<td>Even</td>
<td>Yellow, Blue</td>
</tr>
<tr>
<td>An Post</td>
<td>General</td>
<td>Mid</td>
<td>Spot</td>
<td>Green, White</td>
</tr>
</tbody>
</table>

Figure 13

I believe from this observation you can see that stores of a similar type are using very similar colour palettes to attract their customers. For instance, food outlets and supermarkets are using quite earthy, relaxing colours which will offer a calming influence to try get people to spend longer in the store. Two of these introduce red which can enhance a feeling of hunger. The clothes outlets are almost all using the same colour palette of earth colours, Blue, Green and Brown.
Conclusion

It is clear to see the progression from scientific explorations to modern application. There is hardly a single part of our day that is not affected by colour in some way. As Johannes Itten stated, “Colour affects us, whether we are aware of it or not”. (Ekperigin, N. PDF. Itten’s Color Wheel. 2000.)

The role of the designer has evolved over time from being someone to place text and an image to being someone who understands the many layers of colour psychology and uses it as a tool to refine their designs, often incorporating colour into the function of a design. Whether you are a designer targeting specific consumer markets, or deciding what colour to use in hospitals and other health facilities to encourage recovery, colour is a tool as important as any other in the process.

When designing my own brand I gave a lot of consideration to what colour palette I would choose and selected a minimal palette of Blue, Orange and Black. The blue and orange were specifically chosen for their impact as much as for the physical and psychological reaction to them. My business card now gets an instantly positive response.

We use colour to communicate in almost every aspect of our daily lives whether we realise it or not. Nature has conditioned us to respond to many stimuli and colour is no different. As a designer it is hugely important to have an understanding of those responses as we would any other language.

Creativity by Design

Hugh Shelley
Creative Lead

Figures 14 & 15

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Appendices

Appendix A - Observations of colour use in retail spaces in Swords, Co. Dublin.
References


