The Psychology of Color

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Have you ever been "green with envy" or "felt blue"? Have you been accused of looking at the world through "rose colored glasses"? All of us have heard these and other similar expressions before. These are just a few of the ways we have infused color into our language and related them to our emotional state of mind. Does color truly have an affect on our emotions? This paper will explore that question and look at the many ways color influences our lives.

Since the visible spectrum of color appears when light is refracted, before we can begin our exploration of color we will first take a look at the influence of light upon living organisms. Every living thing on the planet is affected by light. There are insects that are drawn to light (moths) and those that run from it (cockroaches). We can put a plant in a sunny window with all of its leaves facing toward the room. In a few hours the leaves will have all turned toward the window reaching for the light. A plant needs light for the process of photosynthesis by which it feeds itself. During this process the plant also converts carbon dioxide into oxygen which we, ourselves, need to breath. So we could say that without light we would not be able to breathe! In the animal kingdom, birds fly south to warmer climates when the light begins to diminish in the north. Bears go into hibernation for the winter to sleep until the light returns in the spring. Of course the animal kingdom has its nocturnal creatures as well, with owls, rats and even geckos preferring to hunt at night.

What about us humans? Humans need direct contact with sunlight to produce vitamin D as well as keeping the pineal gland, which regulates the production of hormones, functioning properly (iamm.com). People, who live in northern climates, where they are deprived of the sun for six months at a time, suffer from a condition known as Seasonal Affective Disorder or SAD. According to sada.org, SAD is "...caused by a biochemical imbalance in the hypothalamus due to the shortening of daylight hours and the lack of sunlight..." This disorder causes sleep problems, lethargy, overeating, and depression. Some sufferers even experience "hypomania" or over activity in the spring and autumn (sada.org).

All of these examples show the affect of light on living organisms. What about color? In the time of Aristotle it was believed "...all colour to be the product of a mixture of white and black." This belief continued until 1666 when Sir Isaac Newton, during an experiment with light and prisms, proved that light could be broken into a range of color. This range of color is what we call the visible spectrum. It was Newton who chose the seven hues - red, orange, yellow, green, blue, indigo, violet - and also allied these colors to the notes of the diatonic scale ranging within the octave from middle C to B above middle C respectively (Encyclopedia Britannica Online and peacefulmind.com).

Building on what Newton taught us about light, it has since been discovered that light travels on waves at about 186,300 miles per second (Amber, 1964). These waves have length and vibration. At the red end they are longer at 700nm compared to 400nm at the violet end. Due to this difference in length and vibration, infrared, which is below the red end of the spectrum, is felt as heat while the waves at the violet end are experienced as cooler. Thus we have our distinctions of "warm" and "cool" colors (Encyclopedia Britannica Online). Now let us look at how these differences affect us.

On a physical level it has been shown that the effect of exposure to pure red light is stimulating. There is an increase in heart rate, respiration and blood pressure. Red light has an exciting effect on the nervous system, especially the sympathetic branch of the autonomic nervous system. On the other hand, exposure to pure blue light has the opposite effect: lowering of the heart rate, respiration, and blood pressure with especial effect on the parasympathetic branch of the autonomic nervous system. This particular fact has led me to speculate that the use of the color red to signal stop for our traffic lights, as well as the red of car tail lights, could be a contributing factor to what we know as "road rage". It would seem that as we sit and wait for the light to change or traffic to move we must be getting more and more excited.

Since it has been shown that color indeed has such a significant affect on our physical being, it should follow that it has a psychological affect as well.

We have already established that we think of red colors as warm and blue colors as cool. Let us look at the various ways in which humans relate color to their everyday lives. In 1982, a study at New Mexico State University was done on 337 children from grades four to six. "In the regular classroom setting they were asked to respond to a simple questionnaire that included 12 questions all worded in the same style; e.g., 'What color does *hope* make you think of?' The subsequent questions replaced the word *hope* by the following in sequence: *anger, sadness, honesty, fear, happiness, pain, love, death, strength, school,* and *life.*" The results showed that, "When all 12 concepts were combined, red was the color most often named (16.4%), followed closely by black (15.1%), blue (14.4%), and white (9.1%), these four colors seeming to carry the most symbolic meaning for children" (The Journal of Psychology, 1983, 113, p.247-250). This study also points out the fact that the children's associations of the colors did not differ much from adults, indicating that children pick up early on cultural associations. Americans, as a culture, associate color in a variety of ways. I have already mentioned the use of red and green for traffic signals. What follows is a list of other associations prevalent in our culture. Notice that most colors have both a positive and a negative association.

Color	Mental Association	Direct Association	Objective Impressions	Subjective Impressions
Red	hot, fire, blood	danger, Christmas	passionate, exciting	rage, fierce
Orange	warm, autumnal	Halloween, Thanksgiving	lively, energetic	exuberance
Yellow	sunny	caution	cheerful, inspiring	high spirit, cowardice
Green	cool, nature	St. Patrick's Day	refreshing, peaceful	disease, guilt
Blue	cold, sky, water, ice	service, flag	subduing, melancholy	unhappiness
Purple	mist, shadow	mourning, Easter	dignified, mystic	loneliness
White	cool, snow	cleanliness, flag	pure, clean	brightness of spirit
Black	night, emptiness	mourning	death, depressing	negation of spirit

(Birren, 1961, p. 143)

We may not all agree with some of these associations, but they are pretty standard in our culture. Color associations differ in other cultures, however. While researching this paper, I had the opportunity to present some of my findings to a University of Hawai'i at Hilo ESL class. During our discussion, some of the students shared with me beliefs of their culture when it comes to color. One student form Taiwan said that in his country, if a person wears a green hat, others think that his/her spouse has been unfaithful! This student also shared that yellow deemed someone as nasty or slutty. A student from China mentioned that the color of mourning in her country was white, the opposite of ours. When I asked her why this was, she could not say. Likewise, when she asked why we use black, I could not say (UHH ESL 073, November 26, 2003).

In Islamic culture green and gold are the colors of paradise. Speaking of those who will enter paradise the Qur'an states, "...ornaments shall be given to them therein of bracelets of gold, and they shall wear green robes of fine silk and thick silk brocade

interwoven with gold,...(18:31)" and they will be "Reclining on green cushions and beautiful carpets (55:76)." Mosques throughout the Middle East are noted for there "green and blue surroundings." The most famous mosque in Istanbul is even called "The Blue Mosque". These colors were chosen for their religious significance and have been associated with worship since ancient times. "In the *Encyclopedia of Healing Therapies,* Anne Woodham and David Peters relate that these colors have contained significant meaning since prehistoric times. In ancient history, green was the color of growth, and blue was thought of as the color of the sky and of heavenly peace" (http://198.65.147.194/english/Science).

For centuries Hindus practicing yoga have associated color with power centers, known as chakras, in our bodies. From the base of the spine to the crown of the head, these centers correlate to the spectrum and, in some cases, the qualities associated with them closely relate to the list of associations given previously. Red, at the base (survival); orange, at the sacrum (creativity); yellow, at the solar plexus (joy); green, at the heart (harmony); blue, at the throat (communication); indigo, at the forehead (intuition) and violet, at the crown (enlightenment) (peacefulmind.com).

The list of established color symbolism within organizations includes the Catholic Church and its vestments for certain seasons, monarchs and their heraldry; even colleges and universities associate color with their major faculties. So it seems that tradition is a large part of our psychological makeup and that color is very much entwined with our psyche.

It has also been found that color influences the evaluation of food and drink. For instance, red is commonly associated with sweetness (cherries and strawberries e. g.). Yellow and green are associated with citrus flavor and green especially with food that is unripe. In a study done on fifty junior high school students, the participants were given 10 samples of an aqueous sucrose solution in liquid and solid (gelatin) form, which were identical except for color, in random order. "...the green solutions were perceived as less sweet than the others. In contrast, increasing the intensity of red coloration was found to increase perceived sweetness..." In a similar study, "...dry white wine was colored and given to inexperienced participants and experienced wine tasters. Their results support the hypothesis that expectations based on associations between color and taste can alter perceived taste. The inexperienced participants perceived no difference in the sweetness of the differently colored wines. However, the experienced wine tasters perceived the pink-colored wine to be sweeter than the others..." probably due to its resemblance to rosewine, which is sweeter than white (Journal of Psychology; September 1998, volume 132 issue 5, p561).

In a study done in December of 1999, Nancy J. Stone and Anthony J. English tested the affects of color in the work place and it's correlation to performance. What they found was "...a red office is more stimulation and may cause vigor, anger or tension..." However it was found to increase performance. It was found that blue in an office may "...cause greater depression, as well as sadness, fatigue or relaxation..." and that "...workers in white offices complained of more head aches and instances of nausea" (muohio.edu).

My original question was does color have an affect on our emotions and how we perceive the world? As a result of the above findings, I conclude that yes, color has a definite affect on our emotions and our perception of the world.

One of the most prolific writers on the psychological affects of color was a psycho-neurologist named Kurt Goldstein. The bulk of Dr. Goldstein's work was done in the late 1950's and early 1960's. About the aspects of color in our everyday lives he wrote: "Life is a condition alternating between excitation, destruction, and unbalance [followed by] reorganization, equilibrium and rest. In the course of life colors play their role. Each color had a special importance and all colors together help to guarantee a normal life" (Birren, 1961).

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