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| Aside from the initial interaction between the light and the object, color only exists in our minds through the complex process outlined above, which is composed of many interactions involving the eye and brain.  Since color is more of a property of the eye and mind, as opposed to a property of light wavelengths, it is reasonable to assume that all eyes do not perceive colors similarly (Human Color Vision).  For example, our American culture often speaks of wives having to choose color-coordinated outfits for their husbands because men have a difficult time choosing clothing colors that match well.  Although this is often regarded merely as a means by which women tease their husbands for a shortcoming, scientists believe there is some truth behind their taunting.  Studies of sensation and perception have provided evidence supporting the fact that not all humans share the same color experiences and that there are even differences in color perception between males and females of the same species  (Human Color Vision).  The most fundamental property of human color vision is trichromacy, a theory which explains our color perceptions.  Researchers for some time have believed that a person with normal vision contained three cone types in the retina, the S-cones or blue cones, M-cones or green cones, and L-cones or red cones.  The excitation of these cones in certain ratios would produce the specific colors.  The S-cones were believed to have a peak spectral sensitivity for wavelengths near 440 nanometers, while M-cones had a peak spectral sensitivity for wavelengths near 540 nanometers, and L-cones peaked at 560 nanometers.  In more recent years, psychologists have questioned whether small variations in color perception exist among individuals who have small differences in the spectral sensitivities of their photopigments.  Although many initially viewed the psychologists’ hypothesis with skepticism, evidence grew and technology advanced, drawing more scientists into the field of color research (Human Color Vision).  Recent research using psychophysical microspectrophotometric studies and molecular genetic studies have shown that there is considerable variation in the number of photopigments and spectral sensitivity of the cone types in any given normal-color vision eye.  Although research indicates that there is only one photopigment with a peak spectral sensitivity in the short wavelengths, or blue part of the visible spectrum, further studies proved evidence that there are numerous middle length, or green, photopigment sand numerous longwavelenght, or red, photopigments.  This means that the middle wavelength photopigments and long wavelength photopigments have varying spectral sensitivities within five to seven nanometers of one another.  These differences in spectral sensitivity of the cone photopigments could account for the variations in color perception and preference within a species and between genders (Human Color Vision).  The recessive genes that encode for the production of red and green (long wavelength and middle wavelength, respectively) photopigments are X-linked.  Among color researchers, this immediately raises the question as to whether males and females perceive colors differently, which in turn affects their preference in color, because women have two X chromosomes while men have only one X chromosome.  The genes which code for the middle and long wavelength sensitive (green and red) pigments are found at the end of one the arms of the X chromosome and have extremely similar DNA sequences. In fact, the sequences of the red and green genes are the same at ninety-eight percent of their nucleotides (The Human Eye).  It only takes the substitution of one amino acid in the DNA sequence of a gene for a photopigment to cause a change in the spectral sensitivity of the photopigment, and hence a change in the individual’s color perception.  These genes are therefore susceptible to the kinds of genetic errors that will produce multiple gene copies and hybrid genes that are genetic composites of the original ones (Human Vision).  Even the possibility of mismatches in synapsis during meiosis and unequal crossing over is increased (The Human Eye). The fact that each X-chromosome carries a cluster of two to nine ospin genes helps counteract the genetic mutations that can take place so readily with the genes coding for the red and green photopigments.  A person with normal red-green vision  only needs one ospin gene that will affectively absorb red wavelengths and one ospin gene that will affectively absorb green wavelengths.  If the X-chromosome has up to nine genes coding for these photopigments, there is a higher probability that one of each wavelength will be functional and the person will have normal color vision.  Even if seven of the nine ospin genes have defects caused by mutation, but there are two functional photopigment genes, one coding for green and another for red, the individual will have normal color vision because the presence of additional mutated genes will most likely not cause serious problems. However, if there is not one normal copy of each gene coding for the production of both a red and green photopigment, the individual will have color deficiency.    ([Intro1](http://docs.google.com/introduction.html))([Intro2](http://docs.google.com/intro2.html))([Intro3](http://docs.google.com/intro3.html))([Intro4](http://docs.google.com/intro4.html))  [[Home](http://docs.google.com/home.html)][[Introduction](http://docs.google.com/introduction.html)][[Hypothesis](http://docs.google.com/hypothesis.html)][[Procedure](http://docs.google.com/procedure.html)][[Data](http://docs.google.com/data.html)][[Conclusions](http://docs.google.com/conclusions.html)][[Bilio/Links](http://docs.google.com/biblio.html)]  [2002 Projects][2001 Projects][2000 Projects][1999 Projects][1998 Projects] |