



**CALIFORNIA STATE SCIENCE FAIR  
2005 PROJECT SUMMARY**

<b>Name(s)</b> <b>Christine K. Renschler</b>	<b>Project Number</b> <b>J0330</b>
<b>Project Title</b> <b>To See or Not to See, That Is the Question: The Impact of Light Intensity and Color on Visual Acuity</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of my experiment was to determine if visual acuity is affected by the color and intensity of light.</p> <p><b>Methods/Materials</b> I set up visual acuity tests on a laptop computer to resemble a standard Snellen chart eye test, but using two light intensities, bright and dim, and four colors: blue, red, green and grey. Subjects took ten vision tests sitting 20 feet from the laptop in a dark room after their eyes had adjusted to the dark for 5 minutes. They were first tested for color blindness. Then they took nine visual acuity tests, a standard eye test in black and white, followed by the bright red, green, blue and grey tests and then the dim red, green, blue and grey tests, all displayed on a black background.</p> <p><b>Results</b> 15 subjects had an average visual acuity of 7.9 lines, equivalent to 20/20 vision on the standard Snellen test. Three subjects were color blind, but their results were similar to the other subjects, so their scores were kept. Visual acuity in brighter colors were approximately one line worse for red (7.1 lines), green (6.9 lines) and grey light (7.1 lines), and almost 2 lines worse for blue (6.3 lines). Average visual acuity was much worse with the low light intensities: red 5.8 lines, green 6.3 lines, grey 6.1 lines and blue 4.0 lines, equivalent to 20/50 vision.</p> <p><b>Conclusions/Discussion</b> Color and intensity of light affect visual acuity. Visual acuity is greater with higher light intensities than with low light intensities, and at low intensities, worse with blue letters than with red, green, or grey letters. At high light intensities, cones are responsible for vision. At low light intensity, rods are responsible for vision. Cones are found in the fovea of the retina at a much greater density than rods, which probably accounts for the greater visual acuity with brighter colors than with dimmer colors. Blue light may not be absorbed as well by the rods as green and red light, which would explain my results.</p>	
<b>Summary Statement</b> My experiment determined that human visual acuity is affected by color and intensity of light.	
<b>Help Received</b> Father helped to setup the project (i.e. measuring out the 20ft.); Uncle provided idea to use a laptop for the testing.	