



California Science Center  
**CALIFORNIA STATE SCIENCE FAIR**  
**2001 PROJECT SUMMARY**

<p><b>Your Name</b> (List all student names if multiple authors.) <b>Cheng-nin Chang Chang</b></p>	<p><b>Science Fair Use Only</b></p>
<p><b>Project Title</b> (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) <b>Do All Three Cone Cells Fatigue at the Same Rate?</b></p>	<p><b>S1504</b></p>
<p><b>Preferred Category</b> (See page 5 for descriptions.) <b>15 - Physiology</b></p>	<p><b>Division</b> <b>_ Junior (6-8) <u>X</u> Senior (9-12)</b></p>
<p><b>Abstract</b> (Include Objective, Methods, Results, Conclusion. See samples on page 14.) Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.</p> <p><b>OBJECTIVE:</b> The objective is to determine if the three different types of cone cells (red, green and blue light-absorbing pigment cells) on the human retina fatigue at the same rate.</p> <p><b>MATERIALS AND METHODS:</b> Ten test subjects were chosen to participate in this experiment. In order to measure the fatigue rate of the different cone cells, afterimages were used to indirectly determine the time in which a particular cone cell fatigued. For this, three papers each with a different colored diamond (blue, green, red ) were prepared. The test subjects were asked to stare, one at a time, at each colored diamond for 10, 20, 30, 40, and 50 seconds. They were asked to then shift their gaze to a white board, and the color, shape, and size of the afterimages seen were recorded. The shortest amount of time that was required to see the correct afterimage was determined to be the fatigue time for that particular cone cell.</p> <p><b>RESULTS:</b> Through the experiment, the results showed that the green cone cells fatigued in the shortest amount of time. The average fatigue time of the green cone cells for the ten test subjects was 15.5 seconds. The average fatigue times of the red and blue cone cells were similar: blue: 20.9 seconds and red: 20.0 seconds.</p> <p><b>DISCUSSION:</b> Almost everything in the natural world is green--the forests, grasslands and all of the vegetation in our environment. If everything around us is green, the green cone cells would be stimulated the most. This may be helpful because as the green cone cells fatigue, the remaining cone cells (blue&amp; red) are more available for stimulation. This can enable one to perceive a changing stimulus which may be a source of danger.</p>	
<p><b>Summary Statement</b> (In one sentence, state what your project is about.) <b>THE EFFECT OF DIFFERENT COLORS ON AFTERIMAGES.</b></p>	
<p><b>Help Received in Doing Project</b> (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.</p>	