



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Kate Lee Newcomb	Project Number J1529
Project Title At What Angle Does Refracted Light Create a Mirage?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of the project is to determine the angle at which light refracts to create an inferior mirage. The second goal of the project is to get a better understanding of the physics of light.</p> <p>Methods/Materials The purpose of the procedure was to create an artificial mirage to refract a laser beam and measure the angle of refraction. Set up apparatus (laser, stove, metal plate, and target), record the variables to be changed (distances of laser and heated plate to target, and temperature of heated plate) and record the zero point of the laser beam on the target for the particular trial. Run an experiment (heat the plate to create the mirage) and record the variables that need to be recorded for that trial (maximum and average distances laser beam moves from zero point). Repeat until data is collected for several sets of setup conditions (variables to be changed) are recorded. Then take the recorded data and calculate angle of refracted light using trigonometry from zero point and refracted laser beam positions and the distance from the heated plate to the target.</p> <p>Results The data collected is from the nine different experimental trails. The distances of the heated plate and the laser were increased to produce a more measurable effect. The overall angle of refracted light was calculated after performing the experiment. The experimenter observed that the mirage is only visible when the line of vision is almost parallel to the surface. The results were that none of the angles of refracted light were less than 179 degrees, referring to the experimenter's hypothesis.</p> <p>Conclusions/Discussion The angle of refracted light discussed in the hypothesis is the angle between the projected beam and the resulting refracted beam (obtuse angle). Several trails were conducted to verify the accuracy of the data recorded. The resulting refraction angles (acute) ranged from 0.13 to 0.51 degrees. Therefore, the angle of refraction (obtuse) was over 179 degrees, which confirms the hypothesis of this experiment. Several other conclusions were made by the experimenter based on observations of this experiment. However, prior to conducting this experiment, the experimenter did not fully realize the limited conditions required to create the mirage effect, particularly with regard to the condition that a mirage will only refract light that is nearly parallel to the surface of the mirage.</p>	
Summary Statement To discover the angle of refracted light needed to create an inferior mirage.	
Help Received High school teachers assisted with designing the experimental apparatus and my Dad helped with conducting the experiment and the mathematical equations.	