



# CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

<b>Name(s)</b> <b>Auggie W. Nanz</b>	<b>Project Number</b> <b>J1620</b>
<b>Project Title</b> <b>How Bright Is the Sky? A Study of Sky Brightness and Its Effect on CCD Imaging in Escondido and San Diego County</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My project is to measure the sky brightness at various locations in San Diego County, ranging from the darkest part of the county in the desert to one of the brightest areas near the Escondido Auto Park, and to measure how much the sky brightness affects the limiting magnitude of a CCD image.</p> <p><b>Methods/Materials</b> For the sky brightness measurements, I used a SBIG ST-2000 CCD camera with a 45mm f/6.6, 297mm FL, lens. I took more than 100 exposures at 13 different sites on clear, dry nights. For each site, the exposures consisted of a series of three exposures each of durations of 30-, 60-, and 120-seconds. Using MaxIm DL, I measured the median dark-subtracted pixel counts for the background of each image. Using sky brightness data from Palomar Observatory, I converted all measurements into magnitudes per square arc-second. For the limiting magnitude data, I used a SBIG STL-11000 camera with an 8 in. f/5 @ f/6 Newtonian telescope on a Takahashi NJP mount. I took over 60 images consisting of 5-, 10-, 30-, 60-, 120-, 300-, and 600-second exposures at Blair Valley and my house. I used data from Cartes du Ciel and the Rochester Astronomy website to calibrate my magnitude data.</p> <p><b>Results</b> I found that a light-polluted sky is far brighter than a dark sky with a full moon. I also found that the closer that you are to a city, the brighter the sky is. For example, it was over twenty times brighter at the Escondido Auto Park than in the desert. Using the limiting magnitude data, I can conclude that for short exposures (30 seconds and less) the sky brightness does not significantly affect the limiting magnitude of an image. For longer exposures, it appears that the amount of data required to acquire the same limiting magnitude is directly related to the sky brightness in a 1:1 ratio. For example, my house is four times as bright as Blair Valley, which means that for long exposures, I will need to take four times as much data at my house to obtain the same limiting magnitude as data taken at Blair Valley.</p> <p><b>Conclusions/Discussion</b> This research is important because the brightness of the sky directly affects the quality of astronomical work by adding noise to the background. More work can be done on this subject, using different filters for different wavelengths.</p>	
<b>Summary Statement</b> The objective of my project is to measure the sky brightness at various locations throughout San Diego County, and to measure its affect on the limiting magnitude of a CCD image.	
<b>Help Received</b> My dad helped me carry some of the heavy equipment, transported me to my sample locations, and helped construct my display board.	