



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

| | |
|---|---------------------------------------|
| Name(s) Kyle A. Groves | Project Number S1805 |
| Project Title The Consequences of Light Pollution and How Filters Can Limit Its Effects in Astronomy | |
| Objectives/Goals To analyze the background light in the sky known as light pollution, observe its affects on observations in the night sky, and test filters to evaluate their effectiveness. | |
| Abstract Methods/Materials Meade LX 200 reflecting telescope; Canon camera; Celestron UHC/LPR filter 2 inch; Orion SkyGlow filter 1.5 inch; Laptop computer; Spectrograph using a prism and Meade DSI CCD Imager camera; Mercury, hydrogen, and helium spectrum tubes; Bushnell reflecting telescope; Green and red laser pointers. Procedure: Set up the spectrograph, connected to a computer. Adjust the mount and prism to so that bands are in optimum position. Adjust so that the bands are narrow and cleanly separated. Photograph the spectrum of mercury, hydrogen, and helium spectrum tubes. Place fiber optic cable of the spectrograph in place of the eyepiece on a telescope and photograph the spectrum of the night sky. Photograph the night sky with filters on the spectrograph. Photograph mercury light with the range of filters attached. Adjust exposure for each of the filters for each of the wavelengths so that they are the same intensity as unfiltered. For Telescope: Point telescope at the Orion Nebula, M42. Photograph it unfiltered, then filtered with both the Orion SkyGlow and the Celestron filter. Travel to a place without light pollution (in this case the pinnacles) and photograph the Orion Nebula. | |
| Results The spectrograph readings of the night sky show that both filters block mercury light. The night sky's spectrum reveals that the primary light is mercury. The testing of the spectrum tube with different filters attached to it shows that the Celestron filter blocks mercury's spectrum of light more effectively than the Orion SkyGlow, but the Orion allows the most frequency 630 light through. This is important as it is closest to the frequency of H-Alpha, one of the most prominent types of light in nebulae like M42. Pictures through the telescope reveal that the Orion SkyGlow filter yields the best image of M42, though it is still not as sharp or detailed as without light pollution, as represented by a picture taken from the Pinnacles. | |
| Conclusions/Discussion Filters do not replicate conditions with no light pollution, but they can get fairly close, and they block out a wide spectrum of mercury light effectively. This is important to the Salinas Observatory as it is heavily effected by light pollution, and these filters can help limit its effects. | |
| Summary Statement My project is about how light pollution interferes with viewing celestial bodies through telescopes in urban areas and how different filters can lower its negative effects. | |
| Help Received Mr. Philip Deutsche provided me with help, advice, and equipment. | |