



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

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Project Title A Galaxy Ablaze from Afar: Infrared Spectrometry of S5 0716+714 Using the Spitzer Space Telescope, a Second-Year Study	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to model the spectral energy of blazar S5 0716+714. For the second-year study, the goal was to find a redshift for the target to allow the thermal energy to be modeled using Planck's Law and also to develop a synchrotron radiation model.</p> <p>Methods/Materials The Infrared Spectrograph (IRS) Spitzer Space Telescope was used to take a spectrum of the target, and a spectral reduction program, SPICE, was used to extract the spectrum and convert it to a two-dimensional form. The modeling was done using Fathom, a data analysis tool.</p> <p>Results A silicate emission feature was detected at 18 microns, and literature showed that this feature appeared at 10 microns in the rest frame. These values were used to calculate a redshift of $z = 0.8$, which was then used to calculate the rest wavelength of the "bump" seen in the SED. This wavelength was applied to Wien's Law to calculate a temperature for the bump, which was used with Planck's Law to construct a thermal model. The redshift was further used to determine the velocity and distance of the target, yielding values of $.53c$ and 7.14 billion lightyears, respectively.</p> <p>Conclusions/Discussion The synchrotron and thermal models were used to approximate the shape of the bump, however an exact match didn't occur. This suggests that other sources of radiation are present. By changing the parameters of the temperature and adding a second synchrotron component, a better approximation of the actual data was observed. For a follow-up project, more data points will be added to the SED to give the models a better shape. This will allow a more accurate model to be developed.</p>	
Summary Statement To model the thermal radiation of blazar S5 0716+714, the Spitzer Space Telescope was used to take a spectrum of the target in order to calculate a redshift to be used in Planck's Law.	
Help Received teacher taught steps for writing proposal for Space Telescope, Mark Lacy taught us the Spitzer data reduction steps	