



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Lindsey K. Sweeney	Project Number J1536
Project Title Blackbody Thermal Emission	
Abstract Objectives/Goals My project objective was to determine if color has any effect on thermal emission in an enclosed environment. It is common knowledge that black objects warm quicker than non-black objects. This experiment was developed to find out if black objects emit and thus cool at a greater rate. Methods/Materials Two aluminum blocks are used for the project because they have a large amount of mass and will cool slowly, making it easier to check the temperature. First, a standard has to be set, so both blocks are uncoated. Then, after the desired data is obtained, one of the blocks should be lightly painted with a flat black, durable to high heat, paint. Two environments, for these blocks to cool in, have to be constructed, in which conduction and convection are controlled. Radiation should be the only variable. Two wooden dowel structures and two cardboard boxes are used to control conduction and convection. The boxes must have closeable openings that are used for readings. Two mercury candy thermometers will be put in a hole drilled in each aluminum block. These should be checked every five minutes until the graphed line of the recorded temperatures becomes almost horizontal. Results After all data was analyzed, it was found that the black coated aluminum block cooled down faster than the non black block consistently throughout all three experiments, supporting the hypothesis. What was not expected was the difference in the rate of cooling between the two blocks. At some points in the cooling, the black aluminum block cooled twenty-five degrees or more than the other block. Conclusions/Discussion The results acquired from the experiment supported the hypothesis, but more than that, it showed that the effect of a nearly insignificant coat of flat black paint was the cause of a 25-degree Celsius difference, during the time of the greatest rate of change, between the two aluminum blocks. A Difference of 5 degrees Celsius would have been enough to conclude that the hypothesis was supported. This was five times that! The temperature drop due to the flat black paint was so much more than expected that I was certain that I would find it used everywhere that efficient cooling is required. It is apparent that this cooling effect is not common knowledge because while looking around for applications, barely any were found.	
Summary Statement This project was determining whether a heated blackened mass emits infrared radiation more efficiently than a heated non-blackened mass.	
Help Received My father helped me research information on my project, and helped me drill the holes in the aluminum blocks.	