



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Catherine M. Colella	Project Number 35030
Project Title Spacecraft, Micrometeoroids, and Photons: A Model of Micrometeoroid Impingement to Simulate Thermal Shielding	
<div><div>Objectives/Goals Micrometeoroids pose a significant threat to space exploration. Resistance to micrometeoroid impact is a significant design challenge for spacecraft and spacecraft designers. Long-term exposure can threaten the functionality of spacecraft systems through loss of thermal control. This project investigates the effect of micrometeoroids, using a model, on thin gauge thermally protective metals. Thermal protective capabilities will be modeled and analyzed.</div><div>Methods/Materials Cardboard box (black interior), 500 W halogen lamp, Styrofoam, thermocouple and probe, sand, various thin gauge metals. Heated metal in box using lamp until thermal equilibrium reached. Measured metal temperatures through repeated trials. Calculated photon emission based upon material and estimated emissivity using Stefan-Boltzman relationship. Repeated with sanding of metals to simulate impingement.</div><div>Results Hypothesis of sanded (impinged) surface emanating more heat was shown. Thinner copper had unexpected results, presumably due to some possible invisible oxidation or perhaps more infrared penetration.</div><div>Conclusions/Discussion Found thinner .003 in. material would be most successful for thermal shielding. Aluminum appeared to be best material. Results revealed large amounts of heat would emanate from an impinged surface.</div></div>	
Summary Statement This project investigates the effect of micrometeoroids, using a model, on thin gauge thermally protective metals.	
Help Received Teacher provided suggestions. Parents showed how to use spreadsheets.	