CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
Andrew Johnson; VanderKlught

Project Number
31552

Project Title
Hot and Cold

Abstract

Objectives/Goals
The objective of this experiment is to prove that a white wood roof is a better thermal insulator than other possible materials and color combination in this experiment.

Methods/Materials
Materials: Wood, Aluminum, Rubber, Power saw, Hammer, Nails, Seven Thermometers, Glue, Clamps, Plywood, and Paint.

Method: Six miniature scale houses were built, with either wood, rubber or metal roofs. One roof of each material was painted black and on roof of each material was painted white. These houses were then exposed to simulated day and night time, with inside and outside temperatures taken at intervals.

The difference between the inside and outside temperatures was calculated and recorded in a table for each twenty-minute period.

Results
The average of the temperature differences shows that while the lamps were on the white houses conducted the least amount of thermal energy and the black houses absorbed the most. The black rubber house consistently absorbed the most thermal energy but the white houses varied between the three materials. While the houses cooled, the black houses retained the most thermal energy and the white houses lost the most thermal energy. Again the black rubber house was consistent.

Conclusions/Discussion
The hypothesis is plausible because all the white roofed houses stayed cooler during the daytime and all of the black roofed houses retained more heat in the nighttime. The black rubber roofed house held heat the best at night, making them better in cold climates with ample sun. The white roofed houses reflected the heat the best, making them better for warmer climates.
Improvements can be made in the future experiment by adding insulation around the exterior of the houses. This insulation will help reduce the absorption of heat through the sides of the house. Another improvement is the use of a control group of houses with unpainted roofs. We have determined that the roofing material does not have as large of an affect as the color of the roofing material. When using the averages of all the testing the best material and color for heat reflection is white metal. The best material and color combination for heat absorption is black rubber.

Summary Statement
A shelter's roof made of wood and painted white, will be a better thermal insulator for the shelter than other materials and color combinations.

Help Received
Drews Mom for editing. Drews Dad assisting us in building. Matthews parents for getting us together. Mrs. Dixon for giving us input throughout the project.