



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> Chase W. King	<b>Project Number</b> <b>J1010</b>
<b>Project Title</b> <b>Hot and Cold Insulators: Can You Keep Your Cool Naturally?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective was to determine whether some abundantly available and often wasted, natural or recycled materials, such as coconut husks, dirt, rice hulls, straw, cocoa bean hulls, packing peanuts, shredded plastic water bottles or denim, could be used as viable, efficient "green" alternatives to the typical R-19 home insulation used in most buildings today. My hypothesis was that natural or recycled materials, which can be compacted well into small spaces, would prove to be effective insulation in both hot and cold environments.</p> <p><b>Methods/Materials</b> To determine this, I constructed a "room" from 1/2" plywood and surrounded it with an outer plywood wall leaving a 3 1/2" wall space for insulating materials, including floor and ceiling insulation. The materials listed above, as well as R-19 fiberglass insulation, was packed into the wall space around the inner "room". A test with no insulation at all was also tested for comparison. Using a consistent starting "room" temperature, the box was tested with each insulating material in both a hot (65° C oven) and cold (0° C freezer) environments. A digital thermometer probe was placed into the center of the "room" and used to record the temperature rise or drop in 1°C (hot) and 2°C (cold) increments until a maximum or minimum temperature had been reached. The data was placed in a spreadsheet and compared in graph format.</p> <p><b>Results</b> Dirt proved to be the best overall insulator in both hot and cold environments. Furthermore, the majority of the natural ingredients which were found to pack tightly together proved to be efficient insulators and were found to be superior to R-19.</p> <p><b>Conclusions/Discussion</b> I concluded that there are several abundant, natural materials (dirt, cocoa bean hulls, shredded coconut husks, rice hulls and denim) which could be used as highly effective home insulators when compared to R-19 or the uninsulated home. These materials were selected because they are readily available in many countries and are currently discarded or burned. If we can develop a way to contain and easily install these items into an easy-to-use insulation product (i.e batting or fleece), it could be a viable alternative in areas where these materials are plentiful and inexpensive. Designing homes using existing hills to act as insulation, or adding living roofs will cut down on energy use and pollution.</p>	
<b>Summary Statement</b> My project will test natural and recycled materials in both hot and cold environments, comparing them to R-19, to determine if they can be a viable alternative for efficient home insulation.	
<b>Help Received</b> Parents purchased supplies and supervised power tool use.	