



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> <b>James P. Harper</b>	<b>Project Number</b> <b>S1512</b>
<b>Project Title</b> <b>Conserving Energy: What Should Be Insulating Your Walls?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My experiment was designed to answer: Between two concentric cubes of wood designed to approximate an average American home, what medium will yield the best insulation properties? I hypothesized that air would yield the best insulation properties. Air is much less dense than the other materials used in this experiment and since the transfer of heat is the same as the transfer of kinetic energy from one atom to another, the lower density of air would be a better insulator than the other materials.</p> <p><b>Methods/Materials</b> I began researching what insulation and building materials are used in standard construction. A local contractor assisted me in my research. I then designed scale diagrams of two boxes. Each box was built with an outer and inner shell. One box was constructed with plywood, the other with OSB/waferboard. These building materials are both standard in the construction of houses. I inserted a probe into the center of the inner box and subjected my model to controlled environmental tests. I used a freezer, simulating wintertime in the real world. The different kinds of insulation I used were fiberglass, cardboard, newspaper and air. First, I checked the temperature of the environment outside the box. Second, I brought the concentric cubes to room temperature and proceeded to test each box with each insulation in each environment, recording each datum every five minutes. I recorded the external and internal environmental temperatures at the beginning of each experiment.</p> <p><b>Results</b> For each experiment, my data yielded a smooth S-shaped curve. Each experiment took about 2 ½ hours. My results led me to the conclusion that fiberglass is the best standard insulation material of the four I used in testing.</p> <p><b>Conclusions/Discussion</b> The insulation used in standard construction, fiberglass, yields better results, meaning less heat transferred per minute, than just air, newspaper or cardboard. My results did not support my hypothesis. I learned that convection currents, which are suppressed by cardboard, newspaper and fiberglass, allow a greater transfer of heat between the internal and external environments. Since air did not inhibit these convection currents, caused by the temperature differential between the two environments, the heat from the center of the cubes transferred outward faster than when the boxes had another insulation.</p>	
<b>Summary Statement</b> This project is concerned with finding out what combination of standard insulation material and standard building material yields the best insulation properties.	
<b>Help Received</b> My father helped me design and test; my mother helped proof writing; Bruce Carmichael lent me his table saw and construction expertise; Mr. Eric Fink provided a thermometer for testing.	