



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Taylor M. Avery	Project Number J1102
Project Title Will Trapped Air Improve the Insulation of Clothing Materials?	
Abstract Objectives/Goals The purpose of this experiment was to expand upon the project I conducted last year. Last year, I determined which clothing material would provide the best insulation when subjected to extreme cold. As warm blooded animals, humans must take precautionary measures to protect themselves when exposed to extreme cold. One way to protect the body is by wearing clothing that will reduce the body's heat loss. Last year, I determined that fleece was a better insulator (worse conductor) than leather and denim. The hypothesis: Trapped air will improve the insulation value of the clothing when exposed to extreme cold. Methods/Materials Over a period of approximately four weeks, at periods of two hours each, a vessel containing two cups of water heated to 37 degrees Celsius (C) was placed in a freezer (-20 degrees C). The temperature of the water was read every 15 minutes using a digital thermometer. Ten trials were taken of the vessel without any insulation. Next, twenty trials were taken of the vessel insulated by fleece. Finally, twenty trials were taken of the vessel insulated by two layers of fleece with trapped air (bubble wrap) in between the layers. Results The results of the study showed that the average temperatures of each type of trial after two hours in the freezer were: Baseline (no insulation) -.62 degrees C Fleece 7.45 degrees C Fleece and trapped air 10.32 degrees C It is concluded that the trapped air did contribute to improving the insulation of the fleece. The hypothesis was correct. Conclusions/Discussion This result supported the hypothesis that the trapped air would further improve the insulating capabilities of fleece. The temperature of the vessel wrapped in fleece & bubble wrap was the best insulator. This is true because it was the least dense. The atoms in air are far apart, making it a poor conductor. This allowed for less conductivity. While the vessel used was not the best model for a human, nor did it react exactly as a human would, it is important to remember to limit exposure to extreme weather temperatures.	
Summary Statement Will a vessel insulated by fleece and trapped air have a higher insulation value than the same vessel insulated by fleece alone when exposed to extreme cold over a period of two hours?	
Help Received My mother helped to type report and plot graphs and my father helped to assemble backboard.	