



# CALIFORNIA STATE SCIENCE FAIR 2007 PROJECT SUMMARY

<b>Name(s)</b> <b>Daniel P. Clarkson</b>	<b>Project Number</b> <b>J1205</b>
<b>Project Title</b> <b>Analysis of Hydrophobic and Insulative Properties of Various Textiles</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> I enjoy hiking and outdoor activities. Avoiding hypothermia is very important when in the elements, especially in the winter. I decided to investigate the hydrophobicity of different textiles and study the properties of thermal insulation for each textile. I was interested in determining which was the best textile to wear when participating in mountaineering or other outdoor activities.</p> <p><b>Methods/Materials</b> The materials I tested were cotton, wool, nylon, silk, silk shantung, and water proof nylon. To test the hydrophobicity of each material, I poured a measured amount of water onto a 20 cm x 12.5 cm piece of fabric and recorded the weight. I compared this measurement to the weight of the fabric when it was dry. To test the thermal insulation of the fabrics, I created an insulated test environment using a Styrofoam cooler with a piece of Styrofoam in the center, effectively dividing the cooler into two halves. I then cut a 17.5 cm x 10 cm hole in the center of the centerpiece. I tacked a sample of each fabric over this hole and measured the temperature difference between the two sides for both wet fabric and dry fabric samples. This allowed me to measure the change in temperature across the fabric when heat was added to one side of the Styrofoam cooler. I used a standard hairdryer as a convective heat source.</p> <p><b>Results</b> The material that absorbed the most water and was the least hydrophobic was cotton. The two most hydrophobic textiles were water proof nylon and wool. Water proof nylon was slightly more hydrophobic than wool. The nylon absorbed slightly less water than the wool. However, the results were not different enough to prove that water proof nylon was statistically more hydrophobic than wool. In my test of thermal insulation, I found that wet cotton was the most effective insulator.</p> <p><b>Conclusions/Discussion</b> I found that water proof nylon and wool were equally hydrophobic and that cotton was extremely hydrophilic. However, I believe that my results in the insulation test might have been affected by the hairdryer. The hairdryer used in the test blew hot air directly onto the wet material causing forced evaporation, cooling the non-heated side. If I were to repeat this experiment, I would be sure to use a radiant source of heat.</p>	
<b>Summary Statement</b> I tested the hydrophobicity and insulative properties of various textiles and found that water proof nylon and wool were equally hydrophobic and that the findings in the insulative test may have been flawed by forced evaporation.	
<b>Help Received</b> My science teacher provided measuring instruments; My parents bought the materials needed.	