



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Morgan W. Spadone</b>	<b>Project Number</b> <b>J0230</b>
<b>Project Title</b> <b>Portable Water Heater</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> To build a portable hot water heater using house hold materials.</p> <p><b>Methods/Materials</b> Collect the materials: heater hose, thermos, copper tubing, on/off valves, hose clamps, tube connector, charcoal chimney starter, epoxy glue, charcoal and water pump. Wrap the copper tubing around the chimney in an upward spiral. Cut two hoses and insert one at the top and bottom of thermos. Then connect to the copper tubing. Add shut-off valves and water pump. Fill thermos with water, add chacoal and newspaper to chimney,ignite. Once charcoal is hot, pump water through coils and allow thermal siphoning to take over, heating the entire tank.</p> <p><b>Results</b> At first the pump was leaking. Adjustments had to be made to stop the leak. The pump was braced up so not to leak. In following tests the water in the 5 gallon tank did increase from 60 degrees F to 98 degrees F within 90 minutes. The temperature of the water on top of the thermos was measured at 115 degrees F.</p> <p><b>Conclusions/Discussion</b> When water is heated in a closed container, convection occurs causing cooler water to sink and warm water to rise. Additionally, thermal siphoning occurs when the water is heated. The warm water moves in a circle through the thermos out the hose, through the coils and back into the thermos again. This technique could be used for outdoor survival during emergencies. More testing using environmentally "friendly" materials would be beneficial to improve upon this invention.</p>	
<b>Summary Statement</b> A portable hot water heater to be used for outdoor living or in the event of an emergency where hot water is needed.	
<b>Help Received</b> My dad helped me select the items from the hardware store. He also helped me with the power tools, Exacto knife and when using the epoxy glue. My mom helped with the testing when having to light the charcoal. She also helped me glue and cut paer for my presentation board.	