



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Tyrone T. Chen</b>	<b>Project Number</b> <b>S1603</b>
<b>Project Title</b> <b>The Effect of Increased Angle Elevations on Node to Node Distances during Film Boiling</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Since film boiling generally follows the exponential relationship of decreasing node to node distances for increasing angles of elevation, the effect of increasing the angle of elevation to 90 degrees is predicted to follow this same relationship.</p> <p><b>Methods/Materials</b> A special container was created to induce film boiling on a stainless steel wire by running voltage or a current through the wire and heating the surrounding liquid. Images for every trial were captured using the high-speed camera in addition to the Redlake imaging program. Then, each node to node distance was measured using relative distance measurements as taken from the camera shot. After this process was repeated for ten trials at each of the four angles of elevation chosen, the node to node distances were averaged for each angle. This process was completed for both the 0.2mm and 0.5mm diameter wires.</p> <p><b>Results</b> The results from the 0, 30, and 60 degree angles verified the results of previous research proving that for increasing angles of elevation, the average node to node distances decreases. In addition, the 90 degree angle of elevation was also seen to follow this same relationship.</p> <p><b>Conclusions/Discussion</b> These successful experiments show that the vertical film boiling has smaller node to node distances than any other elevated angle, and the idea of vertical film boiling can be applied to several applications for releasing heat more efficiently. Even systems that currently use film boiling, such as in certain nuclear reactors and heaters, can be improved for greater heat release efficiency if the 90 degree angle of elevation is applied.</p>	
<b>Summary Statement</b> My project involves the improvement of heat transfer through film boiling.	
<b>Help Received</b> Used the lab equipment at the UCLA Boiling and Heat Transfer Lab at UCLA under the supervision of Dr. Gopinath Warriar	