



**CALIFORNIA STATE SCIENCE FAIR  
2003 PROJECT SUMMARY**

<b>Name(s)</b> <b>Nicholas A. Hosein</b>	<b>Project Number</b> <b>S0707</b>
<b>Project Title</b> <b>The Utilization of Nitinol in an Artificial Limb</b>	
<b>Abstract</b> <b>Objectives/Goals</b> To develop an artificial finger using Nitinol. The main problem faced with creating an artificial limb using Nitinol is the unpredictable nature of the wire under non-ideal conditions. Slight air currents, exposure to light, and variations in room temperature affect the amount of current needed to alter the length of the wire. My main goal is to control the Nitinol for use in an artificial limb. <b>Methods/Materials</b> This problem was solved by using a microcontroller to measure the angle of each joint and changing the current through the wire to compensate for any environmental variations. Another problem was deciding between using an active bias (Nitinol contracts freely) or a constant bias (constant force opposing the contraction) in the artificial limb. Three tests were conducted on the Nitinol. Test one and two were used with an active bias system while test three was used with a constant bias system. The first test determined the percent contraction of the wire as a function of the current. It also determined the superelastic current range, which is used to maintain the limb at a set position. The second test determined how the force of the Nitinol varied with current and therefore the stress range under which the Nitinol safely operates. The third test determined how the bias force affected the percent contraction of the Nitinol. It was also used to predict the results of test one for a constant bias system. Each set of results contributed the data required by the microcontroller to control the Nitinol. <b>Results</b> The artificial finger worked as intended. <b>Conclusions/Discussion</b> Using the microcontroller to change the current sent to the wire was the best solution to the initial problem.	
<b>Summary Statement</b> Developing an artificial limb using a shape memory alloy	
<b>Help Received</b>	