



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

<b>Name(s)</b>  <b>Jason Co</b>	<b>Project Number</b>  <b>S0308</b>
<b>Project Title</b>  <b>The Multipurpose Prosthetic: Using 3D Printing to Create Various Attachments for Amputees</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives</b> Throughout their daily lives, amputees have trouble performing various tasks that we simply overlook or take for granted. Activities such as operating a computer can become difficult when losing the ability to use an arm. The objective of this project is to help amputees by creating task specific interchangeable prosthetic attachments.</p> <p><b>Methods</b> Last year my teammate Sohan and I had created a makeshift prosthetic by cutting the bottom of a plastic water bottle to simulate a body powered prosthetic. We created a 3D printed adapter which attached a quick disconnect drill chuck onto the bottle cap. This allowed us to create attachments that would have hex bits connected to them in different ways. By extending their arm, the amputee would be able to disconnect and reconnect attachments with ease using a common body powered mechanism. This year I wanted to incorporate electronics into the project in order to add more capabilities to the attachments. I created a 3D printed wrist in place of the water bottle to showcase how the drill chuck would attach to a 3D printed prosthetic. I used a Myoware myoelectric sensor to detect a flexed muscle in the forearm called the wrist flexor, a muscle that flexes when squeezing the hand. I create a computer mouse attachment so that amputees would be able to move and left click the mouse with their prosthetic arm. Assuming that the person was not a double amputee, this would allow them to use the keyboard with their uninjured hand (typing, gaming).</p> <p><b>Results</b> Participants reported an average of 70% of their clicks registering to the computer. Through testing, I discovered that the success rates of the myoware differed for each person. While person C was able to use the attachment without trouble, person D had trouble even clicking once. The project was partially successful, but the consistency of the attachments needs to be higher to meet the criteria.</p> <p><b>Conclusions</b> Although still in the prototyping phase, the myoelectric mouse attachment was still able to complete its job. Many amputees stated that at some point during testing they had trouble with the Myoware muscle sensor. In the future, I plan to adjust the gain values and play with the sensor so that the data output is accurate.</p>	
<b>Summary Statement</b>  The multipurpose prosthetic is a quick disconnect prosthetic that allows amputees to switch attachments with ease by simply extending their arm. The goal of the project is to assist amputees in their everyday lives by creating cost effective	
<b>Help Received</b>  I designed and created the prosthetic attachments myself. I contacted clinical biomedical engineers Brian Burkhardt and Seth Hills for feedback on my project via email	