



# CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

<b>Name(s)</b> <b>Julie A. Fuller</b>	<b>Project Number</b>  33568
<b>Project Title</b> <b>What's the Drag with Swimming? How Effective Are Swim Caps in Reducing Drag?</b>	
<b>Objectives/Goals</b> My objective was to determine whether a swim cap reduces drag on a swimmer, and if so, whether a swimmer with long hair or short hair would benefit most. Similar to a cyclist wearing a helmet, I believe that it may be possible for a long haired swimmer to create a similar effect allowing water to flow smoothly over the head to the shoulders, filling in the gap in the neck area decreasing drag. <b>Abstract</b> <b>Methods/Materials</b> With my dad's help, I created a test rig (similar to a wind tunnel, for water), which was placed in our swimming pool. I placed a plastic model of a swimmer's head and torso on a slide inside the rig. A current was created using garden hoses, which put pressure on the swimmer ("drag"). Through a cable and lever system, pressure was applied to a scale. I measured the amount of drag in grams which was then converted to newtons. I did three tests for each category of swimmer, with and without a swim cap, with a short hair wig, long hair wig and no wig. <b>Results</b> The results showed wearing a swim cap reduced drag in all situations. The best drag reduction occurred by a long haired swimmer with a swim cap. <b>Conclusions/Discussion</b> My base test was a bald swimmer without a swim cap (0 newtons). All other tests were compared to that swimmer. Adding a swim cap to the bald swimmer, reduced the drag to -.0196 newtons. The short haired swimmer without a swim cap had 1.01 newtons of drag; this was reduced to -0.0785 newtons with a swim cap. The long haired swimmer without a swim cap had .539 newtons of drag; this was reduced to -.2844 newtons with a swim cap. The least amount of drag occurred with long hair in a swim cap, which confirmed my hypothesis. I was correct that the long hair under a cap would perform best, but wrong because I was unable to fill in the gap at the nape of the neck as I originally thought. The caps used were too tight to allow the hair to be positioned where I initially wanted. By observation, it appeared that drag reduction was achieved by diverting the water around the nape of the neck.	
<b>Summary Statement</b> My project compares drag reduction utilizing a swim cap over various lengths of hair.	
<b>Help Received</b> Prosthetics, Etc. helped me create the "swimmer" used for my tests. Dad helped me build my test rig and perform the tests. Mom helped me with my display.	