



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Caitlin A. Redak	Project Number S0320
Project Title Black Widows vs. Orb Weavers: Extracting the Difference	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My goal was to determine if orb weaver spider webs are stronger, with a higher tensile strength and breaking strength, than black widow spider webs. Because orb weavers build webs that are in the open air, their webs need to withstand more force to catch flying prey, than black widow webs which are built close to the ground in secluded areas to catch walking or crawling prey.</p> <p>Methods/Materials I extracted silk from six black widows and three orb weavers and then paced that silk on a hand-made, card stock slide with one of three determined lengths to measure breaking strength. Lightweight washers were placed on the silk until it broke and the mass required to break the silks was calculated to find breaking strength in g/cm. More silk was then extracted, placed under a high-powered microscope, and imaged to determine the diameter of a cross section of silk. The area was then calculated and used in combination with the mass required for breaking strength to find the silk tensile strength in N/mm².</p> <p>Results I found that breaking strength of both species' silk was stronger in shorter silks than in longer silks, however, there was no statistical difference between the average breaking strength of the two species. I found that the diameter of silk increased as spider mass increased for both species and that the diameter was slightly larger in black widows. I found no relationship between tensile strength and the length of the silk suggesting tensile strength is a physical property of the silk regardless of length. Finally, because orb weavers have a slightly smaller diameter silk, their silk has a higher tensile strength than the silk of black widows.</p> <p>Conclusions/Discussion I could not accept my hypothesis that breaking strength was higher in orb weavers than black widows because they were not statistically different for a given length. I did accept my hypothesis that orb weavers had a higher tensile strength than black widows. With this result about tensile strength, I concluded that tensile strength, being a measure of how much a material can stretch without breaking, or elasticity in general, is a substitute for stability.</p>	
Summary Statement My project compared the breaking strength and tensile strength of black widow spider and orb weaver spider silks to determine if one was stronger than the other.	
Help Received Mr. Tom Prentice, Dr. Richard Redak, Ms. Breanna Harris, and Dr. Kimberly Hammond helped with the collection of spiders; Dr. Richard Cardullo instructed on the use of Zeiss Axiovert 10 Inverted Phase Microscope; Dr. Kimberly Hammond provided lab space at UCR and was consulted.	