



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

Name(s) Caitlin A. Redak	Project Number S0320
Project Title A Comparative Analysis of Silk Strength	
Abstract Objectives/Goals I hypothesized that the orb weavers would have a higher tensile strength and so a higher energy required to break the silk because their silks are built in the open and subject to more disruption. This means that orb weavers would be able to capture more flying insects or larger insects because their silk would sustain more force before breaking than the silk of a brown widow. In addition, because tensile strength adds to the elasticity of an object, orb weaver webs would be more elastic in the face of harsher environmental conditions (wind, rain etc.). Methods/Materials I extracted silks from four orb weaver spiders and four brown widow spiders and placed them on hand made slides. I imaged the silks and used the images to calculate the cross-sectional diameter of the silk. I used a Nano Bionix Universal Testing System (a machine that measures, stress, strain and tensile strength) to determine the silk strength of each spider. The measurements taken were then used to calculate the energy required to break the silk. I also used known mass and flight velocity data for flying insects (a typical fly and a bumblebee) and a bullet to calculate the subsequent velocity needed to break the silks. Results I accepted my hypothesis that orb weaver dragline silk has a higher tensile strength and subsequent energy and breaking velocity than brown widow dragline silk. Conclusions/Discussion I concluded that tensile strength (a measure of how much a material can stretch without breaking, or elasticity in general), is a substitute for stability.	
Summary Statement I tested the tensile strength, energy to break, and velocity to break black widow and orb weaver spider silks	
Help Received 1. I used lab equipment at UCR under the supervision of Dr. Richard Cardullo; Mr. Tom Prentice and Dr. Cheryl Hayashi helped in providing and the collection of spiders; I used lab equipment at UCR under the supervision of Dr. Cheryl Hayashi; I had help from Dr. Richard Redak proof-reading my calculations.	