



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Caitlin A. Redak	Project Number S0215
Project Title Black Widow Dragline Strength	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I am interested in spiders because they rely on the strength of their silk for their own support and to capture and hold their prey. Silk is expensive to make, but I thought spiders would need to make extra strength silk so it wouldn't break as easily. This raised the question: is the silk's full capacity being used to hold the spider or is it able to hold more? My hypothesis was that the spider's silk is not being used to full capacity and it can hold more weight for things such as prey, water, or environmental forces like wind.</p> <p>Methods/Materials I extracted silk from the spider using larval forceps, attached it to a clamp and attached a hook to the other end using super glue. I put small washers on the hook until the silk broke. I weighed the washers, hooks and calculated the mass that broke the silk. I weighed all weights and spiders on an analytical balance.</p> <p>Results I used g/cm to show strength and converted it to tensile strength as well. I compared the average of all four pieces for each spider to the spider's mass. I found that as a spider gets bigger, silk strength increases. I also compared the relative strength (g/cm) to actual length of the silk strands. This data showed that short pieces were stronger than longer pieces. I think this means that a shorter piece will hold more because it is more stable than a long strand. That data showed that across the board a spider's silk can hold more than just the spider.</p> <p>Conclusions/Discussion Spider silks can hold a much greater weight than just the spider, so I accepted my hypothesis. Spiders should create webs out of short little strands versus long flowing strands for maximum strength. This is necessary because the spider needs to be able to hold more than just its weight depending on a variance of environmental conditions (wind, water, movement of the prey, etc.). This leads me to question if the dragline is the strongest variety of silk. It seems that it would not be, considering it needs to have the ability to be broken in case of emergency. I would test this in the future.</p>	
Summary Statement I measured and calculated black widow dragline strength to see if it was working to full capacity with a certain amount of weight.	
Help Received Help collecting spiders from Dr. Richard Vetter and Tom Prentice; Used lab equipment at University California, Riverside under the supervision of Dr. Richard Redak; consulted Dr. Kimberly Hammond on statistical analysis.	