



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> Dylan C. Young	<b>Project Number</b> <b>J0231</b>
<b>Project Title</b> <b>Does the Circumference of a Ball Affect the Power, Work, and Distance of a Ball Fired from a Trebuchet?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of this experiment is to identify the ideal circumference of a ball fired from a trebuchet.</p> <p><b>Methods/Materials</b> Four balls with different circumferences and masses were used for this experiment. The trebuchet was set up and each of the balls were fired 10 times and results recorded. For each ball, the time aloft and distance traveled were recorded in the logbook.</p> <p><b>Results</b> The ball with a 17cm circumference and a mass of 52g put out a force of 68 Newtons, work of 1,323 joules, and a power of 642 joules/second. The ball with a 20cm circumference and a mass of 55g put out a force of 64 Newtons, work of 1,164 joules, and a power of 568 joules/second. The ball with a 23cm circumference and a mass of 138g put out a force of 42 Newtons, work of 685 joules, and a power of 250 joules/second.</p> <p><b>Conclusions/Discussion</b> The hypothesis was correct. The ball with the smallest circumference put out the most work and power. Of the four balls fired from the trebuchet, the ball with a circumference of 17cm obtained the best results. This ball displayed the most power and work. It put out nearly 200 additional joules worth of work over the next ball. The ball with a 20cm circumference ranked the 2nd highest in average distance, work and power. Even though it had approximately the same mass as the ball in 1st place, the air resistance registered a little higher due to a greater circumference. In 3rd place was the ball with a 21.5cm circumference. This ball had the 2nd lowest average distance, work, and power. The ball with a 23cm circumference had the lowest force, power and work out of the four. Possible reasons for this performance were the air resistance was the greatest of the four, because of the larger circumference, and the weight was too heavy for the trebuchet. In conclusion, the distance, work, and power of each ball scaled with its mass and circumference as predicted. The balls with the smaller circumferences and mass performed the best. Further results of this study are pending additional experimentation.</p>	
<b>Summary Statement</b> This experiment is to identify the ideal circumference of a ball fired from a trebuchet.	
<b>Help Received</b> A classmate helped with recording the data.	