



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

Name(s) Neil T. Hoffmann	Project Number J1712
Project Title The Tarzan Problem: What Is the Best Angle to Jump Off a Swinging Object to Maximize Distance?	
<div><div>Objectives/Goals The purpose of my experiment was to find a solution to the Tarzan problem: what is the best angle that Tarzan should jump off the vine to go the maximum distance.</div><div>Methods/Materials I built a swing that uses an electromagnet to hold a metal ball at the end of a rod. The rod was pulled back to 97 degrees and released, breaking a breakwire which cut the power to the electromagnet so the ball went flying. I did 5 trials each for five different release angles: 0 degrees, 15 degrees, 30 degrees, 45 degrees, and 60 degrees. I put sand on a tarp so I could measure how far the ball went. To compare the experimental results to theoretical results, I figured out the equations for velocity, time in the air, and distance, and then plugged all the equations into Excel. With the equations, I varied swing length, height off ground, and pull back angle to see if the results changed.</div><div>Results Based on my measured data for my swing, the best angle to release at is about 37 degrees, but the best calculated angle for my swing is 40-41 degrees. By plugging in different numbers into my equations in Excel I learned there was no one right answer. When you increase the pullback angle, it increases the best angle. When you increase the height off the ground, it decreases the best angle. When you increase the length of the swing, it increases the best angle.</div><div>Conclusions/Discussion The best angle to jump off of a swinging object depends on how long it is, how high it is off the ground, and the angle you start at. The variable that changed the best angle the most was the pullback angle. The maximum best angle I calculated was 43 degrees. This is a true STEM project: Science (potential and kinetic energy, equations of motion), Technology (electromagnets and circuits), Engineering (swing construction), and Mathematics (trigonometry and quadratic equation).</div></div>	
Summary Statement What is the best angle to jump off a swinging object to maximize your distance.	
Help Received Dad supervised swing construction and mom answered questions during scientific research.	