



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Bryce W. Cronkite-Ratcliff	Project Number J0208
Project Title Fire Away Trebuchet: An Investigation into the Physical Properties of a Trebuchet	
Objectives/Goals The objective is to study the transformation of gravitational potential energy into kinetic energy using a medieval siege weapon known as a trebuchet. I hypothesize that the trebuchet will throw the furthest and most accurately when using the lightest and smallest projectile, the heaviest counterweight, and the greatest height.	
Abstract	
Methods/Materials A trebuchet is a medieval siege engine that transfers energy stored in a counterweight into the kinetic energy of an (often destructive) projectile. For this project a trebuchet using a 7-foot (84-inch) arm was constructed along with several different projectiles, and counterweight masses. The experiment consisted of over 100 trials in which I varied the projectile mass and size, counterweight mass, height the counterweight falls, and base type (on wagon, not on wagon), and measured projectile range and aiming accuracy.	
Results The results show that the trebuchet's range improved by decreasing the weight of the projectile, increasing the counterweight mass, raising the height, and placing the trebuchet on a wagon. Projectile size had no effect on the performance of the trebuchet. Measures of performance included range, range resolution, transverse range, transverse resolution, and range efficiency. Many of these results can be understood using the law of conservation of energy.	
Conclusions/Discussion My hypothesis proved largely correct. That is, the trebuchet's performance improved when using a lighter projectile, a heavier counterweight, and a greater height. However, I was surprised to find that the size of the projectile had no effect on the firing distance or accuracy. I also concluded that placing the trebuchet on the wagon improved the firing distance, probably because doing so allows the trebuchet to shift its center of gravity. The wagon also raises the trebuchet an additional foot or so above the ground which probably contributes to increasing the range. My final conclusion is that building and testing your own trebuchet is lots of fun!	
Summary Statement This project studied the transfer of potential energy to kinetic energy by means of a trebuchet.	
Help Received My Dad acted as my mentor for this project, Ripcords.com provided basic trebuchet plans	