



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> Alastair C. Macmillan	<b>Project Number</b>  31826
<b>Project Title</b> The Gauss Cradle: An Experiment on the Application of Magnetic Potential Energy	
<b>Abstract</b> <b>Objectives/Goals</b> The Gauss Cradle uses the concepts demonstrated in both Newton's Cradle and Gauss Rifle to isolate the magnetic potential energy and measure the maximum amount of energy that could be transferred. For my experiment I wanted to see which combination of magnets and ball bearings transferred the greatest amount of energy. I expected four magnets to produce the best result. <b>Methods/Materials</b> I constructed a cradle, which allowed me to test different combinations of neodymium ball magnets and ball bearings. Velocity and maximum height achieved were measured using a backdrop grid and high-speed camera, recording 60 frames per sec. All experiments were conducted during December 2010 and January 2011. <b>Results</b> The results of the experiment were unexpected. When all four magnets were used, the magnetic force holding the end ball on was greater than the force imparted by the shock wave. The end ball did not leave the group. The best combination was two magnets and two ball bearings. <b>Conclusions/Discussion</b> The conclusion of the experiment was that two magnets and two ball bearings produced the greatest height and velocity, therefore energy. This is because the two magnets give the greatest magnetic potential energy, which can be transferred via the shock wave to the end ball bearing. The ball bearing on the end was held with the least magnetic force and therefore had the most efficient transfer of energy.	
<b>Summary Statement</b> The project examines the conversion of magnetic potential energy to kinetic and gravitational potential energy using a Newton's Cradle.	
<b>Help Received</b> Mom helped with the board layout and Dad helped with the power tools when building the cradle.	