



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> Nathaniel R. Armstrong	<b>Project Number</b>  31146
<b>Project Title</b> Magnetic Linear Accelerator	
<b>Objectives/Goals</b> There are two goals to this experiment. The first is to find out if the starting energy of a projectile shooting through a rail gun affects the speed/distance. The second is to find if the increase in speed between each magnet is linear or nonlinear and why. <b>Abstract</b> <b>Methods/Materials</b> The methods in this experiment was having four magnets held in place three inches apart on a piece of wood with a trough cut in it. Then attach a ramp to the end of the piece of wood. Mark a point with a marker on the top of the ramp, a half-inch from the magnet closest to the ramp, and one between each magnet. To test the linear increase test going through only one magnet, two, three, and four. Then compare the increase between no magnets and one magnet, one and two. Also find the difference between from the top of the ramp and before the first magnet. I used ten square gold-plated half inch neodymium-iron-boron magnets. <b>Results</b> The results were that it was a non-linear increase. The increase of energy diminishes with each successive magnet. I believe this is because the magnet increases the energy based on the time the magnet has to accelerate the projectile. The first magnet will have longer than the second, which will have longer than the third and so on. The starting kinetic energy does not matter as to the final distance of the projectile is the same due to the same principle that made it be a nonlinear increase. <b>Conclusions/Discussion</b> In conclusion my experiment proved an interesting and surprising property of magnets and inelastic collisions. My original assumption was that each magnet would increase the distance linearly because the magnets were the same and that the higher the starting energy the farther the distance the projectile would go.	
<b>Summary Statement</b> I built a magnetic linear accelerator and tested properties of magnetism and inelastic collisions.	
<b>Help Received</b> Dad helped build project; Teacher helped review papers	