



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) William C. Meyer	Project Number J0721
Project Title Magnetic Linear Accelerator	
Objectives/Goals My experiment was designed to find the maximum efficiency setting of a simple magnetic linear accelerator.	
Abstract	
Methods/Materials Ruler x1, Duct tape, Magnets x4, Nickel-plated steel balls x9, Stopwatch/other electronic timer. 1. Tear duct tape into strips roughly the width of one of the magnets. 2. Tape first magnet to ruler at 1-inch mark. 3. Tape second, third, and fourth magnet to the ruler at 2.5-inch intervals. (Ex.: The first magnet is at the 1-inch mark, the second would go at the 3.5- inch mark, the third at the 6-inch mark, etc.) 4. Place two steel balls in the groove in the ruler to the right of each magnet. 5. Set up two strips of duct tape 20 feet apart, preferably on a wooden surface. These will be your start and finish lines. 6. Line up the ruler behind the first strip of duct tape. Make sure it is as straight as you can get it. 7. Place the 9th steel ball in the ruler groove to the left of the magnet farthest to the left on the ruler. 8. Use the stopwatch (or other timing device) to record the time it takes for the ball to travel past the second strip of duct tape. 9. Realign the balls and run the experiment twice more at the same setting. (Or however many times you want to repeat it; three times is the minimum amount to obtain a rough average, but if you want to ensure accuracy you can do more trials.) 10. Repeat steps 1-9 with various combinations of numbers of magnets and spacing of magnets. (In my experiment, I used 2, 3, and 4 magnets at 2.5, 3, 3.5, and 4 inches apart, except for 4 magnets at 3.5-inch and 4-inch spacing as that would not fit on the twelve-inch ruler.) 11. Chart your results onto a graph or table.	
Results The optimum setting of a small-scale magnetic linear accelerator is 4 magnets spaced 2.5 inches apart.	
Conclusions/Discussion The optimum spacing of magnets for a magnetic accelerator of this type is roughly 2.5 inches apart. The more magnets placed on the accelerator, the faster the projectile will travel. My hypothesis was wrong; I believed that the optimum spacing was 2 inches apart, which turned out to be impossible as the second ball was attracted to the wrong magnet due to the magnets being too close together.	
Summary Statement A magnetic chain reaction accelerates and launches a steel ball.	
Help Received Father helped time the speed of the balls	