



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> Madeline M. Liao	<b>Project Number</b>  34290
<b>Project Title</b> Magnetic Fields on Mars and Beyond	
<b>Objectives/Goals</b> My objective was to determine how the distance between magnetic poles and the number of them affect the magnetic field strength on a sphere. <b>Methods/Materials</b> Disk magnets representing magnetic poles were taped to the underside of a half of an eight-inch plastic sphere. One, two, three, and four magnets were used. The distance between the magnets started at 0 degrees and increased by 10 degrees for each setting. 20 grams of iron filings were poured from five centimeters above the center of the hemisphere. The hemisphere was turned upside down to allow excess filings to fall off. The mass of the filings remaining on the sphere was measured and showed the strength of the magnetic field. <b>Results</b> When graphed, my data points formed graphs that seem hyperbolic. As the distance between poles increased, the mass of the iron filings retained decreased, except for from 10° apart to 20° apart for trials with two magnets and four magnets, where the masses increased. The graphs of the two and four magnets decreased steadily and began approaching zero around 70°, while the graph of the three magnets approached zero much later around 110°. As the number of magnets increased, the mass of the iron filings retained increased generally. Three magnets started out holding a lower mass of filings than the four magnets, but as the distance increased, it started holding more filings than four magnets. Therefore, a more powerful magnetic field would be created with a greater number of magnetic poles placed closer together. <b>Conclusions/Discussion</b> Overall, my hypothesis was supported. The mass of iron filings retained decreased as the distance between the poles increased, and as the number of poles increased, the mass of the iron filings retained increased, generally speaking. These results show that a more powerful magnetic field is created when the number of poles increases, and the distance between them decreases. If we were trying to make a planet with a weak magnetic field more habitable for humans, we would need to create an artificial magnetic field; the more poles we use and the closer they are together, the more powerful the magnetic field will be.	
<b>Summary Statement</b> How the number of magnetic poles and the distance between them affect the magnetic field strength on a planet.	
<b>Help Received</b> Kendia Herrington (MAVEN Educator Ambassador), and Diana Herrington provided equipment.	