



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

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Project Title When Ions Flow: The Effects of Magnetic Fields on Electric Propulsion	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this science fair project was to test how different magnetic fields affect the shape and direction of a flow of charged ions. We believe that different magnets will affect the shape and direction of the thrust. This information could be used to help control ion thrusters in space.</p> <p>Methods/Materials We first made multiple ion thruster designs and high voltage systems before we came upon the one that worked the best. Various magnets were placed in the ion thruster's chamber. We ran smoke through the thruster to make the flow of ions more visible and took note on the direction and shape of the thrust.</p> <p>Results The magnets that had the greatest effect were the long rectangular magnets, and the large neodymium magnets. The rectangular magnet split the thrust in two and the large magnetic fields slowed the ions down.</p> <p>Conclusions/Discussion Magnets did change the shape of the ion flow. A future study might involve moving the magnet up and down in the thruster to test different angles. Another test might be using a wider range of magnets. Using the information we have collected from the test, future thrusters can use electromagnets to simulate the same magnetic fields. An electromagnetic iris can be used to pulse and control the thrust. This information could be used to make spacecraft more efficient and controlled.</p>	
Summary Statement How do magnetic fields affect the flow of ions in an electric propulsion thruster?	
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