



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Maliha S. Ahmed	Project Number S1901
Project Title The Effect of a Magnetic Field and Applied Voltage on the Rotation of a Fluid Induced by a Lorentz Body Force	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The main concept in MHD is the interplay between an electric field and magnetic field. Both act on a moving conductive fluid and cause it to rotate by creating a Lorentz force on this fluid. My project studied the effect of this force (via velocity), as an electric current was passed through a conducting fluid in the presence of a magnetic field. The independent variable was voltage, which was varied by using different batteries pre-set to different voltages. The dependent variable measured in the experiment was velocity. Different magnets were experimented with, including neodymium-iron-boron magnets and ceramic magnets. My hypothesis was that as voltage increased, velocity would increase as well.</p> <p>Methods/Materials Two electrodes were constructed by wrapping aluminum foil on the inside of a petri dish (outer electrode) and by rolling aluminum foil into a tight cylinder which was placed in the center of the dish (inner electrode.) The arrangement of magnets was placed underneath this dish, to keep magnetic field perpendicular to the current flow/drift velocity. From a strong conducting electrolyte solution (NaCl) to a weak conducting one (CuSO₄ solution), 15 ml of each were measured for experimentation using a graduated cylinder.</p> <p>Conclusions/Discussion Overall, the trend seen in the experimental values was consistent with the calculated values. Calculated values were mathematically derived from the Lorentz force law. By using a weakly conducting solution, I was able to preserve laminar flow which is essential in the study of MHD. This interesting phenomenon has a wide array of applications that occur in various settings from Earth's fluid core to microfluid devices implemented in biology laboratories utilizing polymerase chain reaction protocols.</p>	
Summary Statement My project investigated the effects of a magnetic field and voltage on magnetohydrodynamics to further understanding of the unique phenomenon.	
Help Received Mother, help with board; Mrs. Gabriela Scully, help with physics; brother, help with mathematical derivation; Bakersfield College professors, help with concepts and proper experimentation	