



# CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

<b>Name(s)</b> Sarah J. Adams	<b>Project Number</b> <b>J1503</b>
<b>Project Title</b> <b>Eddy Who? The Study of Alternating Magnetic Fields and Their Effect on Non-ferrous Conductors</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective was to learn why an alternating magnetic field repels non-ferrous metals and why a magnet slides slowly down a non-ferrous conductor.</p> <p><b>Methods/Materials</b> A wheel was created with six alternating magnets. The wheel was set up under a structure and a power drill was added to keep the wheel spinning at a constant speed. Then, pieces of copper, aluminum and wood were suspended next to the rotating magnetic wheel to exhibit Faraday's Law. Then I measured the distance that the pieces were repelled away from the wheel. To demonstrate Lenz's Law, I placed a copper plate at the end of the axle. A magnet was placed on the steel hinge next to the spinning copper plate for observations. Lastly, aluminum, copper and wooden plates were set at an incline so that a magnet could slide down. Time measurements were made on the three different materials.</p> <p><b>Results</b> In the experiment demonstrating Lenz's Law, the magnet slides slower down the copper than the aluminum. The magnetic field around the magnet, when moving relative to the copper makes the electrons within the copper move in swirls, called eddies. These eddies generate an electromagnetic field around the copper, which then repels the magnetic field around the magnet. By studying Faraday's Laws of Induction, I learned how non-ferrous metals can be repulsed by a changing magnetic field. The positive side of the magnet makes the electrons within the conductor swirl one way, while the negative side of the magnet makes the electrons swirl the other direction. The moving electrons create an electromagnetic field around the copper, which is then repelled by the wheel's changing magnetic field.</p> <p><b>Conclusions/Discussion</b> An alternating magnetic field repels a non-ferrous conductor because non-ferrous conductors have a certain atomic structure which allows easy movement for the electrons. When the alternating magnetic field makes the electrons within the conductor move in different directions rapidly, the movement of electrons creates an electromagnetic field around the conductor. My observations show that the copper has a stronger repulsion than the aluminum. My conclusion is that the electrons flow more freely through the copper than the aluminum. This project may benefit society by applying the principals of Faraday's Laws to extract non-ferrous metals from municipal waste streams.</p>	
<b>Summary Statement</b> The study of alternating magnetic fields and thier effect on non-ferrous metals as they pertain to the preservation of natural resources.	
<b>Help Received</b> Physics teacher and science teacher helped with comprehension; Father helped construct demonstration	