



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

Name(s) Alexander C. Nicklaus	Project Number S0910
Project Title The Effect of a Difference between the Ratios of Cu and Zn in Brass on the Distance It Travels when Fired from a Railgun	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment is to determine the difference in distances of brass when it is fired from a railgun and if the difference in its distance has a trend with the ratio of copper and zinc in its mixture. A railgun is basically two long rails of a conductive metal that has electricity running down each rail. One rail has a positive charge the other a negative. When a conductive material is placed between the rails the circuit is completed. When this happens Lorenz Force is produced the piece of metal should fire down the rails.</p> <p>Methods/Materials For purposes of ease a simple railgun will be used, one which is simply two pieces of copper foil and a battery charger. The projectiles are simple cylindrical piece of zinc, copper, and two types of brass with magnets attached to the ends. First, the rails are charged with one positively charged and one negatively charged by attaching alligator clips from a battery charger to the rails. Then, the projectile is placed on the rails which should fire it down the tracks.</p> <p>Results The overall results point to an inconclusive experiment due to experimental design problems. The percent deviations were 1.95% for the control zinc, 41.29% for the control copper, 53.38% for 50:50 brass, and 48.83% for the 40:60 brass. Zinc's average deviation is 3.16cm, copper 6.52cm, 60:40 brass 7.34cm, and 40:60 brass 5.51cm. The zinc averaged at 162.02cm, copper at 15.79, 50:50 brass at 13.75cm, and 40:60 brass at 11.26cm</p> <p>Conclusions/Discussion As shown in the data, excluding Zinc, the deviation was very high for all of the projectiles. This deviation shows that the experimental error that was present at testing was so great that the data cannot draw any firm conclusion; hence the experiment is inconclusive.</p>	
Summary Statement The purpose of this experiment is to determine the if the distance a brass projectile travels when it is fired from a railgun is affected by the ratio of copper and zinc in that brass	
Help Received Rick Nicklaus: electrical engineer, provided finances, and helped with the project; Suzanne Nicklaus: edited the project; Renna Fosse, Shawnus Chen, Akira Kane: helped with the conception of the idea for the project	