



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

Name(s) Will H. Baldwin	Project Number J0903
Project Title The Levitating Train	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this experiment was to achieve the process of YBCO superconductors steadily levitating above a track of neodymium magnets when cooled using liquid nitrogen. Also test how much the amount of the liquid nitrogen effects the levitation height of two YBCO superconductors mounted on a small balsa wood box.(the train)</p> <p>Methods/Materials</p> <ol style="list-style-type: none">1.)Two 1# in diameter YBCO superconductors2.)230 0.5###0.5###0.125## neodymium magnets (You can get 20 for \$2.21 at CMS magnets.)3.)One 1##1.5##0.125## STEEL sheet4.)Liquid nitrogen (Available at most welding supply stores)5.)One piece of 36###3###1/16## piece of Balsa wood6.)Krazy Glue#7.)Rubber Cement#8.)Drawing Compass9.)Measuring Tape10.)A wide variety of tools including a Ban Saw <p>Results Through the investigation, the average levitation height for the train was 4.9mm above the track, with the highest being 6mm, and the lowest being 3mm. The levitation heights showed that the amount of liquid nitrogen did effect how high. The train was able to stay steadily levitated above the magnetic track in a fixed position, but did have a little trouble on the turns. When the train would approach the turns too fast, it would fall off the track at the peak of the turn. The only way that the train would steadily go around the turns was to give it a slightly smaller push, so the train would approach the turns with less force allowing the magnetic field to hold onto the superconductors.</p> <p>Conclusions/Discussion The project turned out how I expected it to be. The train was able to steadily levitate above the track and slowly go around the track only by me giving it an initial impulse by hand. The amount of liquid nitrogen did greatly effect the height of levitation, but was very hard to measure due to the rapid evaporation of the liquid nitrogen. This shows that if scientists are going to one day make superconducting maglev trains that travel across cities, we will need to use incredibly strong track magnets and superconductors that will be able to hold the tremendous amount of weight of the train and passengers.</p>	
Summary Statement The main point of this project was to achieve the mystifying task of floating a superconducting train above a track of neodymium magnets, and testing how the amount of liquid nitrogen effected the height of the levitation.	
Help Received My dad (Duff Baldwin) helped me lay the magnets on the steel board, and supervised me while using power tools and handling the liquid nitrogen.	