



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Diego Kress; Sean Williams	Project Number S1895
Project Title Quantum Levitation	
Objectives/Goals The objective of our experiment was to figure out how long it takes for a neodymium magnet to seize levitating over a Yttrium Barium Copper Oxide compound cooled with liquid nitrogen. We also tried to figure out the temperature at which the magnet seizes to levitate. Our experiment is based upon the Meissner effect otherwise known as Quantum Levitation. We believed that if the temperature of the magnet reached above -50 degrees centigrade, then the magnet would fail to continue to levitate. We also hypothesized that it will take at least two minutes and thirty one seconds for the magnet to stop levitating once all the liquid nitrogen in the dish had evaporated.	
Abstract Our experiment is based upon the Meissner effect otherwise known as Quantum Levitation. During our experiment we measured the time and temperature once all the liquid nitrogen had evaporated from a Petri dish that the experiment occurred in. We tested this same procedure ten consecutive times. During our experiment we used: 10 liters Liquid Nitrogen, 1 Petri Dish, 1 Supper Conductive Rectangle of Yttrium Barium Copper Oxide (1# Diameter x 1/8), 1 Pair of Plastic Forceps, 1 Pair of Cryo Gloves, 1 500 ml Beaker, 1 Thermometer, 1 Stopwatch, 1 Neodymium Rare Earth Magnet.	
Methods/Materials Our procedure consisted of 11 steps: 1. Prepare Petri dish and place the rectangular superconductor in it. 2. Pour the liquid nitrogen into a 500 ml beaker. 3. Slowly pour the liquid nitrogen so that it covers the top of the rectangle. 4. Use the forceps to pick up the magnet and place it gently over the cooled disc. 5. Continuously measure the temperature of the superconductor. 6. When all the liquid nitrogen evaporates start the timer. 7. Stop the timer when the magnet stops levitating and record it. 8. Measure the temperature when the magnet stops levitating and record. 9. Take the magnet out of the Petri dish. 10. Pour more liquid nitrogen inside until covered. 11. Repeat steps 4-10 until experiment has been preformed 10 times.	
Results The magnet took an overall time varying from 9.2-22.3 seconds to fall. The temperature of the compound however varied from -65.5 to -65.8 degrees Celsius when the magnet dropped.	
Conclusions/Discussion Overall our science experiment was a success and we succeeded in managing to make the magnet levitate, and testing the temperature and time while successfully demonstrating the Meissner effect.	
Summary Statement To test how long it takes, and at what temperature a cooled superconductor stops supporting a magnet through its changes in its magnetic field levitation.	
Help Received Don Kress helped by supplying safety gloves and taking photos; Ms. Reynosa let us use her classroom to preform the experiment, and use of her thermometer; and Praxair supplied the liquid nitrogen	