



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

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Project Title Electromagic: A Comparison of D-Cell Batteries' Electromagnetic Field	
Abstract Objectives/Goals Which battery will last the longest while inducing a magnetic field that will hold up three safety pins. The most powerful battery will hold the safety pins for the longest, and the weakest battery will hold the safety pins for the least longest. The most powerful battery is usually the battery that can last the longest and will have the most milliamps. Milliamps distinguish the strength of a battery and refer to the battery capacity Methods/Materials The first thing I did was buy all the materials I would need to complete my experiment. To accomplish my project I needed to build a wooden base, which I completed with the help of my father. We first sawed a board into two pieces and screwed the two pieces together at a ninety degree angle with three screws. Secondly, I drilled two horizontal rows of holes across the board and had a total of sixteen holes. Thirdly, I put the 5/16" # 5 1/2" bolts into the holes that I drilled and applied the washers and nuts to them. Then I measured eight lengths of copper wire, each one measured 40 inches long. Next I wrapped the wire around the bolts twenty times and left a little extra to attach to the batteries. I bought all the batteries I would need and taped the wires to the batteries. I placed three safety pins on each electro magnetized bolt and then I began my experiment. I started a watch to time the batteries. I watched the magnetized bolts carefully for a safety pin to fall off. Results My experiment was successful and I received my results in less than twenty hours. My results showed that the Duracell Ultra battery lasted the longest holding three safety pins and the RadioShack battery held the safety pins for the least amount of time. The rest of the batteries finished in between thirteen and nineteen hours. Conclusions/Discussion My hypothesis proved correct with the results I gathered. The Duracell Ultra battery powered an electromagnetic field which held three safety pins, and lasted 19 hours and 47 minuets. This was a full hour and forty-two minutes longer than the second best battery, Energizer Max. All of the batteries finished within 5 hours and 37 minutes of each other.	
Summary Statement This experiment compares the Electromagnetic strength of several popular batteries.	
Help Received My dad helped me build my experimental apparatus.	