



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Linnea L. Motts	Project Number S0712
Project Title A Study of Colloidal Battery Performance	
Abstract Objectives/Goals The experiment investigated the influence of resonance absorption and surface plasmon dipole resonance on colloidal battery performance through the divergence of normally nondiverged Heaviside energy flow. By oscillating Ag plasmons to a resonance frequency of about 410 nm, the experiment attempted to collect more energy by diverging the Heaviside flow. Methods/Materials A Ag colloidal solution was created and then used to electrophoretically deposit Ag colloids, or plasmons, onto ITO and sputtered silver film. These electrodes, as well as bulk Ag/Al and thin film reflective corrugated silver/Al were used in a colloidal battery with the Ag colloidal solution as the electrolyte. A UV LED with distinct bands at 400 nm and 410 nm, UV lamp with a range from 400 nm to 600 nm, and UV laser of 409 nm were also used as different UV light sources. A source dipole was established, on the outside of the electrodes in solution, and a voltage applied in order to emit this continuous usually nondiverged Heaviside flow. Results The data supported the possibility of diverging portions of the Heaviside energy flow. Combinations of the dipole, magnetic field, and UV light source were used for the UV LED, UV lamp, and UV laser for each electrode system. However, bulk Ag/bulk Al electrode battery produced the highest voltage and current, and thus power in comparison to the other electrode battery systems. The electrophoretically produced electrode systems also showed a percent increase with the dipole electric field, magnetic field, and UV light source used, with the ITO electrode with a percent increase of 20.8 percent. Conclusions/Discussion The data does support the possibility of diverging the freely flowing Heaviside energy; however, the actually enhancement in the collection of charge was minimal. Numerous variables could have affected the investigation. Notably, the electrophoretically deposited electrodes were in reality crude compared to past experiments and practical development. There was not an ordered array of surface plasmons on the electrodes, which can be produced with a mask. Also, it is impossible to determine the size of the particles and to observe what was actually assembled on the electrode without an electron scanning microscope. With more sophisticated technology available, the experiment would undoubtedly produce much more impressive results.	
Summary Statement The experiment investigated the possibility of diverging the normally nondiverged Heaviside energy flow.	
Help Received Father provided materials.	