



**CALIFORNIA STATE SCIENCE FAIR  
2008 PROJECT SUMMARY**

<b>Name(s)</b> <b>Gregory C. Arena</b>	<b>Project Number</b> <b>J0803</b>
<b>Project Title</b> <b>Shocking! The Effect of the Shape of an Electrostatic Comb on the Charge Production of a Van de Graaff Generator</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The purpose of my project was to determine if the comb shape will affect the electrostatic charge production of a Van de Graaff Generator.</p> <p><b>Methods/Materials</b> The Van de Graaff generator produces static electricity through friction, in this case a rubber belt driven by two different roller materials as far apart on the triboelectric series (a scale ranking materials from releasing to attracting electrons) as possible. As the belt rubs against the rollers, it strips electrons that are gathered by an electrostatic comb and the charge is distributed to the terminal (two rim less stainless steel bowls). The charge concentrates until the electrons discharge forming a spark between the terminal and a smaller grounded sphere. To determine which comb performs best I measured the spark length, as one inch of spark is the equivalent to 25,000 volts. This is determined by the equation <math>E = 0.5 CV^2</math>. Four electrostatic combs were constructed: a thin strand copper wire, a copper screen, an aluminium serrated edge and an aluminium straight edge. Uniform in size, they were tested three times each.</p> <p><b>Results</b> The copper wire comb (the sharpest) performed best, with a mode spark of 1 3/4 inches. The second comb, the aluminum serrated edge, was 1 3/8 inches. The third comb was the copper screen at 1 1/8 inches. The fourth comb (the least sharp) was the aluminium straight edge with a mode spark of 3/4 inch.</p> <p><b>Conclusions/Discussion</b> This demonstrated that a sharp comb is more efficient in charge production. A more efficient Van de Graaff generator can produce more static electricity which is useful in the modern world to sterilize surgical equipment, in the treatment of superficial cancerous growths, in the study of X-rays, and investigation into the possibilities of accelerated plant growth without the need of fertilizers, green houses or hybridization.</p>	
<b>Summary Statement</b> This project was to determine whether the shape of the electrostatic comb would affect the charge production of a Van de Graaff generator; it was shown that the sharper the comb the greater the production of electrostatic electricity.	
<b>Help Received</b> My father helped with the construction of the generator, and comprehension of principles and formula. My mother helped with dictating copy while I typed, and cutting photographs used on display board.	