



California Science Center  
**CALIFORNIA STATE SCIENCE FAIR**  
**2001 PROJECT SUMMARY**

<b>Your Name</b> (List all student names if multiple authors.) <b>Rachel D. Morford</b>	<b>Science Fair Use Only</b>  <h1 style="margin: 0;">S0818</h1>
<b>Project Title</b> (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) <b>Electrodeposition of Calcium Carbonate in an Ocean Environment</b>	<b>Division</b> _ Junior (6-8) <u>X</u> Senior (9-12)
<b>Preferred Category</b> (See page 5 for descriptions.) <b>8 - Environmental Engineering</b>	
<p><b>Abstract</b> (Include Objective, Methods, Results, Conclusion. See samples on page 14.)          Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.</p> <p><b>Project Summary:</b> Project designs an electrode array to manufacture calcium carbonate structures in an oceanic environment, and tests various electric currents for their effectiveness in manufacturing.</p> <p><b>Objective:</b> The purpose of this experiment was to test the effectiveness of various amounts of electric current (changed through the use of resistors) on promoting calcium carbonate build-up in an ocean environment.</p> <p><b>Materials and Methods:</b> 20 anode-cathode apparatus# were created, in 4 sets of 5. Each set contained 5 buckets connected to a resistor value of 220-Ohms, 100-Ohms, 150-Ohms, or 56-Ohms. Each apparatus was built out of a square of galvanized hardware cloth (cathode) and a 7.5 cm long anode made from stainless steel. Each anode was the same distance from the cathode and each apparatus was connected to the resistor (to change the current) and in parallel to a 12-volt power supply. The apparatus# were placed in an artificial ocean environment to accumulate calcium carbonate. Levels of accumulation were determined by the weight of each assembly.</p> <p><b>Results:</b> The apparatus# connected to the 150-Ohm and 220-Ohm resistors promoted the most calcium carbonate build-up by weight, followed by the apparatus# connected to the 56-Ohm and 100-Ohm resistors.</p> <p><b>Discussion:</b> Calcium carbonate structures are used to reinforce piers, create artificial breakwaters and reefs, and could be used to create artificial #floating# islands in the ocean. In previous experiments, cathode shapes and materials were adjusted, as were anodes and environments. These experiments showed that build-up occurred in both the artificial ocean environment and a real ocean environment. They also showed that the galvanized hardware cloth accumulated more build-up, and did not decompose, whereas aluminum screening decomposed after a week in the water. Results indicated a correlation between the reduction potentials of the materials used for the anode and the levels of accumulation (materials with higher reduction potentials yield greater accumulation). The data suggests that for the most accumulation the current flowing through the apparatus should be a small one. This data could be used to enhance our knowledge of the creation of artificial reefs.</p>	
<b>Summary Statement</b> (In one sentence, state what your project is about.) Calcium carbonate is deposited onto a constructed frame using various levels of current, in order to further our ability to create artificial reefs.	
<b>Help Received in Doing Project</b> (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Father helped set experiment up.	