



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Daniel (D.J.) R. Freeman, Jr.	Project Number J0704
Project Title Surfs Up: Will Different Ocean Bottoms Affect the Height of a Breaking Wave? Phase II	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of my project was to determine if different ocean bottoms affect the height of a breaking wave. Phase II of this project was to find more accurate data by using a mechanical wave tank machine at Birch Aquarium at the Scripps Institute of Oceanography. The wave machine provided a constant wave force and by laying out the materials in the area half way between the mechanical paddle and the breaking of the wave, it allowed me to measure the height at the point of the breaking wave. Out of my four bottoms, rocks, gravel, sand, and a simulated reef made up of crushed sea shells and modeling clay, I thought the simulated reef would produce the highest wave. I chose this project to help surfers choose a safe and fun break to ride.</p> <p>Methods/Materials I prepared and formed four oceanscapes by laying out the different materials onto a measured piece of hard plastic. The plastic piece was approximately 2 feet by 2 feet and the rocks, gravel, sand and simulated reef, were attached and it was lowered into the wave machine while it was turned off. A measuring tape was attached outside of the tank at the point where the wave broke. The machine was started and the electronic paddle produce an accurate constant wave. I collected visual data in centimeters as the wave passed by the ruler. This process was repeated 10 times for each bottom.</p> <p>Results The overall results for the highest wave was rocks with an average of 10.5 centimeters. The median was the simulated coral reef with the results of 8 centimeters. In third, the gravel came in with 9.5 centimeters. The lowest result was the sand with an average of 5 centimeters.</p> <p>Conclusions/Discussion After completing my investigation on what type of ocean bottoms affect the height of a breaking wave, I found that my overall hypothesis of the simulated reef making the highest wave was incorrect. By using a mechanical wave machine my results differed from Phase I. In Phase I, I manually pushed the waves and did not have as much control on the force of the wave. Therefore, by using a large mechanical wave machine the results showed that the rocks provide the highest wave. The sand shifted so much that the wave had a hard time forming. I met my objective by proving that surfers can now search for new breaks in areas that can be safe and fun. Plus surf shop owners know where to establish a business where surfers can purchase supplies and this can help the economy.</p>	
Summary Statement The purpose of my science project is to show which ocean bottom will produce the highest wave.	
Help Received Mother and father supervised; Birch Aquarium Directors allowed me to use their Exhibits Wave Machine in San Diego, CA.	