



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Annie C. Benedict	Project Number J0104
Project Title Wave Hello to Blue-Green Energy: The Effect of Blowhole Cavern Depth on Water Ejection from a Simulated Oceanic Blowhole	
Abstract Objectives/Goals The goal of my project was to determine what average water level would allow the greatest water ejection, and thus the greatest wave energy collection, from a blowhole cavern assembly. I hypothesized that more water would be ejected from a deeper cavern configuration Methods/Materials I designed and built a wave tank (2.4 m long x 32 cm wide x 45 cm deep) with a motor-driven wave generator at one end, and a simulated blowhole cavern (15 cm diameter) at the other end. Waves entered one end and water was ejected and collected from a small vertical blowhole spout (1.2 cm diameter) protruding from the opposite end of the cavern. I changed the depth of the cavern six times and ran the timed experiment with multiple trials at each depth. Results My results showed that the most water was ejected from the spout when the top of the blowhole cavern was 0.32 cm below the still water level. Energy collection rate at this depth was equivalent to 3 milliwatts. When the blowhole cavern was placed below or above this depth, less water was ejected (and thus less power was obtained). As waves entered the cavern, air and water were carried forward. When the cavern was raised, more air was inside, so more air and less water was ejected. When the cavern was lowered, there was not enough air to push much water through the spout. Conclusions/Discussion While my original hypothesis was rejected, I was able to determine the optimum cavern depth for maximum energy collection. I believe blowholes could be used as a novel source of renewable energy in the future. In the real world, the water could be collected from a natural or artificial blowhole with the configuration designed for maximum lift. The elevated water collected could be used to turn a water wheel and generator. Thus, clean, renewable energy could be harvested from the inexhaustible power of the ocean.	
Summary Statement For my project, I tested how changing the depth of a blowhole assembly in a wave generation tank affected the amount of water ejected from the blowhole spout (which is a measure of how much energy was collected).	
Help Received My dad assisted me with the construction/set-up of my wave generation tank. My neighbor, Mr. Banner, allowed me to use his wood-turning lathe to make the wooden cylinder for my wave generator.	