



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Marina K. Grimmett	Project Number J1812
Project Title Sound Penetration into Rough Water	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine if more sound will enter a rough water surface than a flat water surface.</p> <p>Methods/Materials A sound blocking disk and a sound directing tube were used to control sound. A pool, two laptops, a speaker, a hydrophone and a fan were used in the apparatus. For each setting, the disk was moved up gradually or the tube moved to a larger angle. This was repeated with 4 different wind speeds created by the fan, 0 knots, 17 knots, 27 knots, and 37 knots.</p> <p>Results When after 13 degrees, the angle at which no sound should penetrate the water, it was seen that the level of fan corresponded with the level of sound. The highest fan setting had the highest level of sound from the specified signal sent out by the speaker, and so on for the low and medium wind speeds.</p> <p>Conclusions/Discussion In both methods, evidence was found that supported the hypothesis, that sound would penetrate at approximately 27 degrees. In each setting, most of the data stayed generally the same with few outliers, although there was variation due to the possibility of sound diffraction. Sound levels with the fan, were higher than without the fan.</p>	
Summary Statement My project is about sound penetration into rough water, and if sound will penetrate rough water more than calm water due to physical laws of sound.	
Help Received My dad brought my attention to this topic, assisted in constuction of apparatus and in the programming of the system through which I took the data, and taught me Snell's Law; Teacher helped edit the research paper and notebook; mom helped in design and construction of the backboard	