



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

<b>Name(s)</b> Drew L. Quishenberry	<b>Project Number</b>  35662
<b>Project Title</b> The Visualization of Sound	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> This experiment explored the visualization of sound. To investigate what sound looks like with limited resources, it was necessary to apply sound waves themselves to different materials. To do this, I constructed two instruments, a Ruben's tube and a tonoscope.</p> <p><b>Methods/Materials</b> These were made out of various plastics, rubbers and metals. The tonoscope uses its long PVC canal to direct the voices sound waves up towards a flexible membrane. This membrane is covered in salt and as the sound vibrates the membrane the salt #jumps# across it. As one sings into this instrument, you will inevitably come across one of this membranes natural frequencies. This phenomenon creates intricate patterns made visible by the salt. The Ruben's tube uses its hollow body to hold gas. This gas is used to fuel tiny flames.</p> <p><b>Results</b> These flames themselves are the points that visualize the sound. The fire responds to points of compression and rarefaction that are caused by sound waves. When different frequencies are played into the tube, a standing wave may appear which causes these small flames to form into peaks and troughs. The recurring theme of this experiment was as the frequency played into either instrument increased, the results became smaller or more intricate in a way. The tonoscopes patterns became more intricate yet less precise. The standing waves on the Ruben's tube became shorter and more compact.</p> <p><b>Conclusions/Discussion</b> This experiment proved that the lower a pitch, the more space between the points of compression and rarefaction and the fewer vibrations per second.</p>	
<b>Summary Statement</b> My project is about using instruments to visualize sound waves.	
<b>Help Received</b> Dad helped build instruments, teacher supervised report writing, parent supervision when using hazardous materials.	