



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

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Project Title Soundproofing: Which Material Soundproofs the Best?	
Abstract Objectives/Goals We hear sounds (or noise) all the time without realizing what impacts their intensity. The objective of this study is to understand the relationship between the density and elasticity of a material versus its ability to block or reduce the intensity of sound. Methods/Materials I placed a cell phone inside boxes made of the materials I wanted to test and used a second cell phone (from outside) to call the phone inside the box. I measured the intensity of the cell phone ring using a sound meter outside the box. This gave me a measurement of how much sound was getting transmitted outside the box. Boxes were made of: Floor Tile, Acoustic Panels, Wood, Plastic, Wall Insulation, Metal (Tin), Cardboard, and Foam. Other testing materials included 2 cell phones, sound meter, and a digital (or triple beam) weighing scale. Results The data signifies that a higher density material provides the most sound insulation. Floor tiles had the highest density, and they therefore sound-proofed the best. While tin had the next highest density, it has a very high elasticity compared to wood. Hence wood sound-proofs more than tin. So the top three are tile, wood, and then plastic. Conclusions/Discussion Density and elasticity are key properties of a material that impact sound-proofing. Highly dense materials such as tile are capable of providing the best sound-proofing. A key finding is that density and elasticity have opposing impacts on sound transmission. As a result, materials such as wood that have lower density than tin, but have lower elasticity will provide more sound-proofing compared to tin.	
Summary Statement I illustrated that density and elasticity of a material have opposing impacts on it's ability to sound-proof.	
Help Received I researched the topic and designed the testing by myself. My science teachers, Mr. Berwald and Mrs. Suresh, reviewed my test results for completeness and logic.	