



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Connor Ashton	Project Number J1701
Project Title Good Vibrations: The Effect of Sympathetic Vibrations on a Bass Guitar	
<p style="text-align: center;">Abstract</p> <p>Objectives I wanted to explore the impact of sympathetic vibration or resonance on a bass guitar. My hypothesis was that the A note would cause the most sympathetic vibration.</p> <p>Methods The procedure is to tune the bass guitar to standard tuning, and set the guitar and amplifier settings to mid-levels. Use the NIOSH sound app on an iPhone to measure the background noise, then play the note, wait 2 seconds, dampen the note and record the played note and resonant note sound levels. Repeat for all 5 notes, and then 20 times for 100 valid readings.</p> <p>Results The experimental result proved my hypothesis that the A note on the bass guitar would cause the largest sympathetic vibration measured by the smallest percent drop in sound level at 89.9%. Although the A note had the most sympathetic vibration, the E and D notes were very close at 88.8% and 88.1% respectively. The G note and the B note had the highest percent drop in sound level with the G at 82.8% and the B at 81.6%.</p> <p>Conclusions The science in general supports the experimental results. There are four characteristics that impact the amount of sympathetic vibration or resonance: the matching frequency at any harmonic between the string played and another string, the harmonic number on the string played and the harmonic number on the sympathetic string, and the distance between the played and sympathetic strings. The A and E notes have the most matching harmonic frequencies at the 3rd, 4th, 6th, and 8th harmonics, and the D note is close behind with 3 matching (3,4,8). Based purely on science, the A and E notes would have the most sympathetic vibration, closely followed by the D string, while the G and B strings would have the least. This project demonstrates the importance of resonance and how it should be accounted for in every day life. There are positive impacts such as in the medical field using MRIs, and negative when resonance causes bridges or rockets to fail.</p>	
Summary Statement The project is about testing the effect of sympathetic vibrations on a bass guitar and determining which note causes the most sympathetic vibrations.	
Help Received My bass guitar teacher, Fernando Montoya, brainstormed some initial ideas for the project.	