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Honors Freshman Physics

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The Effect of Sound Velocity on Relative Sound Intensity

Physics- Sound project

The purpose of this project was to determine if the material of a violin bridge would affect the violin's relative sound intensity. When violin strings vibrate, they transfer energy to the bridge, and the violin body, making sound. A material's sound velocity, affected by elasticity and density, affects sound intensity. If it is high, sound travels quickly and more sound energy is heard at once, unmuffled. It was hypothesized that the material with the highest sound velocity would most increase sound intensity. Sound intensity, measured in decibels, is different than loudness, which varies per person.

The apparatus applied a constant force with the violin bow to the strings, by car and ramp. The violin was in a box, that changed angle to play all four strings, since if any pattern was found, it must apply to all strings. The car, with the bow, was released at the top of the ramp with no additional force. The bow vibrated a string, making sound, and the sound level meter showed the decibel level. Six laser-cut bridges, each with different sound velocities, were tested ten times per string.

The results supported the hypothesis; sound intensity increased with sound velocity, although by less each time. Cherry, the highest sound velocity, produced the highest sound intensity, out of walnut, mahogany, spruce, basswood, and maple. Maple, the control, since it is the most common bridge material, was lower than cherry, so creating a bridge that increases sound intensity is a possibility. Further testing would include testing materials with higher sound velocities to see if sound intensity continues increasing, since the rate decreases. If the sound intensity that the violin can reach affects loudness, violins can be revolutionized.