

Nick Wilbur

Junior Division Physics

Making Waves: The Effect of Bow Size on Violin Sound Waves

The question for my science fair project was: “What is the difference between the sounds produced by different size bows on the same half size violin?” I became interested in this project when I wondered if the design of violin bows could be improved. As a violin and a viola player, I was wondering why some bows are much longer than others. My hypothesis was that different size bows make different wave patterns. I thought that the proper size bow would make a sound most pleasing to the human ear. Five bows were tested, all on the same half size violin. The sound waves were analyzed for how many peaks occurred in one wave pattern. The peaks were categorized into two groups based on size: the major peaks and the minor peaks. I found that the closer the bows were to the right size, more minor peaks and fewer major peaks occurred. The human ear likes sounds that are complex because complex sounds are more interesting. Simple tones, like computer generated sounds without resonance, are identified as unnatural. Because major peaks take up more space in the pattern, more minor peaks in a sound wave are more interesting and natural sounding. As the right size bow sounds the best, bows do not need redesigning and are the correct size and shape. Different instruments do need different sized bows. My hypothesis was that different size bows make different wave patterns. This hypothesis was supported by my data.