

## Beth Purcell / Stephanie Bailey Ph.D.

By Beth Purcell

Here is the art part! This was an inspiring and challenging project! I understood that sound makes patterns. Many of us have had the experience of listening to music and seeing patterns and colors. Actually seeing sound resonance patterns for each instrument and figuring out how to transfer them on to the instrument was a different story. It took several attempts to actually draw the chosen pattern on each instrument.

Hmmm.... then how to choose color? I decided that each instrument needed one basic color to really show off the pattern. I turned to my musician friends, with the question ... "What color do you see when you play your instrument?" Much to my surprise, they all reported back that they did not associate any color to their specific instruments! I decided that I would spend a little time listening to a variety of music involving each instrument, and try to connect a color with each one. The colors you are viewing are the colors I "saw" or felt or intuited for each instrument.

I then went to task choosing my materials, based on color, design and texture. I really enjoyed handling these beautiful instruments intimately and creating colored cloaks for each one. Keep in mind that I used a little artistic license with each of them, as they became personal pieces for me. I hope you enjoy viewing them as much as I enjoyed thinking, dreaming, envisioning, and creating them.

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By Stephanie Bailey

Every object has a characteristic frequency or resonance at which it vibrates most, with the least input of energy. Though you may not be familiar with this term, you actually took advantage of resonance at a very young age. A child's swing has a natural frequency at which it likes to swing  $f$ (resonance). To get the swing going, you pump your legs and arms in time with this natural frequency. The motion builds up with each swing because you are driving the swing at its resonance frequency. If you drove the swing at any other frequency, you would barely move.

String instruments are no different except that they resonate at several distinct frequencies. Interestingly, these resonances are important determinants in the sound of the instruments and have unique patterns associated with them. One effective way to see these patterns is to sprinkle sand on it and attach it to a source of vibration. When the instrument vibrates at a resonant frequency, a pattern appears in the sand.

To our knowledge, this is the first time a mosaic has been made of resonance patterns on actual string instruments (guitar, violin, mandolin, and banjo). In addition to beautiful works of art, these instruments can be used as a tool to teach students about musical acoustics. The front and back plates of the guitar are modeled at 656 Hz and 385 Hz, respectively. Hz is the symbol for Hertz and measures frequency. A frequency of 656 Hz means that the front guitar plate vibrates 656 times each second! The front and back plates of the violin are modeled at 116 Hz and 304 Hz, respectively.