



**CALIFORNIA STATE SCIENCE FAIR  
2009 PROJECT SUMMARY**

<b>Name(s)</b> <b>Xiafei Zhang</b>	<b>Project Number</b> <b>S0318</b>
<b>Project Title</b> <b>Discovering the Color Spectrum of Sound</b>	
<b>Abstract</b> <b>Objectives/Goals</b> My project was to determine how the human brain classified superimposed sound waves # by, conventionally thought, differences in frequency, or by my hypothesis, differences in wave interference. <b>Methods/Materials</b> Using music as a vehicle, I tested 20 music-theory-trained individuals on a total of 500 intervals (two notes each) by asking them to guess the names of the intervals I played for them. I recorded what the individuals guessed against what the true interval was. When I organized the data, these intervals were ordered by differences in frequency and differences in wave interference. Whether their guesses were closer to the actual interval by similar differences in frequency, or similar percentages of wave interference, would provide evidence for the method that was used by the subjects to categorize/differentiate the intervals I played. <b>Results</b> When subjects made mistakes in their attempt to guess the correct interval, their mistakes were close to the correct interval by wave interference, but when the data was organized by pitch frequency, the graphs showed no discernable pattern. Therefore, the human brain has an overwhelming tendency to categorize their sounds by increasing wave interference. <b>Conclusions/Discussion</b> This new found data challenges conventional instruments, written music, and the way music is taught (all with a heavy emphasis on pitch). By figuring out how the brain organizes sound, this experiment basically creates a new color spectrum for sound, able to be utilized by composers and music teachers alike. New, more scientifically based instruments can be created to replace the archaic instruments like the piano, which is organized by pitch. This idea can be applied to other sensations with wave-like properties, such as sensations caused by the electromagnetic spectrum.	
<b>Summary Statement</b> The brain does not, as conventionally thought, classify sounds by differences in pitch, but actually by a spectrum organized by differences in wave interference.	
<b>Help Received</b>	