Assignment VIII, PHYS 150 (Physics of Sound and Music) Pitch and Timbre Due Friday, February 28th, 2014

- According to your textbook's section on pitch discrimination, how many different pitches could a human theoretically identify? (We're not trained for this, so I doubt anyone could actually do this – but it is interesting seeing as though most modern orchestras fall fairly fall short of the piano's range of 88 pitches).
- 2. According to the experimental data shown in your text, what is the absolute minimum time a tone must be played to identify it with a specific pitch?
- 3. Let us say you desire to play a musical piece in 4/4 time with a tempo of 120 bpm. (This means that a quarter note lasts 0.5 second, an eighth note lasts a quarter of a second, a sixteenth note lasts an eighth of a second, etc. you don't need to read music to answer this, just extrapolate the relationship given here to determine what an "nth" note would last via ratios). Based on your answer to the previous question, what is the shortest note that it would even make sense to write down at this tempo, since a note any shorter could not be perceived?)
- 4. What is vibrato, and how does it influence our interpretation of pitch?
- 5. Recall that the physical quantities associated with sound and sound perception include (i)pressure/pressure fluctuation, (ii) frequency, (iii) spectrum, (iv) duration, and (v) envelope. The single Physical quantity that best characterizes sound loudness is pressure (or pressure fluctuation). If you had to choose one Physical quantity to best characterize the pitch of a sound, what should you choose?
- 6. If you had to choose one Physical quantity to best characterize the timbre of a sound, what should you choose?
- 7. If you play tones of 750 Hz, 1000 Hz, and 1250 Hz simultaneously, what pitch will generally be heard?
- 8. Does playing a tone backwards change its spectrum?
- 9. Does playing a tone backwards change its timbre?
- 10. Your book has a quote from Plomp (1970) that calls timbre a "multidimensional attribute of sound". Explain what this means.