Subject: Sound and perception of sound
Posted by Paul C. on Fri, 13 Jul 2001 17:35:13 GMT
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OK, I have been holding off doing this.. but here goes. Wayne, if this is too long, delete it.I had alluded to this in another thread some months ago, that when in college I made, to me, other discoveries in the way we perceive sound, what makes instruments and other sounds sound the way they do. Well, the clarinet, for example, has a waveform that approaches a squarewave. It has only odd overtones. So, it is easy to generate a squarewave... but it does not sound like a clarinet, sort of, but not really. In playing with parametric equalizers, I found that the clarinet tone can be closely imitated, enough to fool a clarinet player, by inserting some high Q resonances, fooling with Q (width and height of a resonance... a high amplitude, narrow frequency range resonance is said to be "high Q") that are fixed in frequency, rather than following the frequency of the fundamental, give the instrument its timbre (tonal character or tone quality). Perhaps this is because the clarinet, being a piece of wood, has inherent resonances in the body of the clarinet itself, that are excited by the fundamental and overtones of the vibrating air column. Also, there are room resonances, both the recording room AND the room in which you listen to reproduced music. So, these vary from room to room, and instrument to instrument, and also player to player. Have 10 saxophonists play the same saxophone/mouthpiece/reed, and you get 10 distinctly different saxophone tones.If you sample a sax tone (or trumpet, or whatever) with your keyboard, and then play up and down the scale, it does not sound like a sax or trumpet or whatever. Certain fixed frequency resonances are missing. The way a player begins and ends a note is missing. Many factors in what we identify with that sound are not present. So, there is more to a sound's identity than just its frequency.Ditto the string bass, only it is more pronounced. In fact, the fundamental of the lowest notes hardly resonate the body of the instrument, only the overtones.The bass saxophone was very popular in early recording... old 78's, the very early dance bands, on radio. You can hear the bass sax in the old black & white cartoon soundtracks, too. The early crude mics, record players, speakers (sometimes only a bamboo needle driving a diaphraghm, coupled to a horn)... the string bass or tuba could not be heard. However, the reedy sound of the bass sax came right on through, you could hear the bass line. Actually, the reedy tone was strong in the overtones...the listener heard the overtones and thought he was hearing the bass notes. You can listen and you know you are hearing a bass sax playing low notes. (I would be glad to send a short MP3 of a bass sax, and you can play with your Winamp's sliders to see what I mean.)So, my conclusion is that a perfectly flat frequency response does not necessarily make a great speaker. A few humpty-bumps in the response curve does not mean it is a bad speaker. The mind just adds these minor imperfections in with all the other resonances and holes and it just blend in with effect... the tone quality of a voice, instrument, whatever is slightly altered, but not really in a way that sticks out... unless it is a huge hole, or a very sharp, very high resonance.HOWEVER, the way a sound begins and ends has a huge impact on how we perceive a sound. We identify direction by sharp, quick transients, a snapped twig, a pebble kicked, a bump. We understand words by the transients added by our articulation... this is what makes good diction easier to understand than mumbling.I had a friend in college, a trumpet player, she got consistent low marks in her end of semester juries for her "tone". Her trumpet teacher told her, "I have been listening to you, your basic tone is good, it is your attack and release that is sloppy." They worked on just those two factors, how she began and ended a note, for the entire next semester. And on her next jury, across the board, comments such as "Excellent! Tone much improved!"SO, in my opinion, what makes a good speaker is not necessarily how it handles frequency (flatness of response curve) but how it deals with sounds in

time (precision, lack of overring, damping, etc). And for me, good horns do this very well... the way the couple the signal to the air, the impact, the quickness... makes them much more realistic sounding IF they are well designed, and reasonably smooth in response. I will give up a few hz on each end of the response curve, if what I have in the middle is precise, low distortion, quick.