Subject: Musical Instuments and Time Alignment
Posted by Paul C. on Sun, 11 Aug 2002 03:17:29 GMT
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In another post a few weeks ago I had discussed time alignment, and how it relates to musical instrument. First, I point out that the overtones are fixed in position with relation to the fundamental (as explained in the paper below). Second, shifting these overtones around, in relation to the fundamental, is not audible in sustained tones, though this will affect transient sounds.Then there was the question of "time alignment" in the concert hall... that is, due to a listener's position in relation to instuments on a stage, the sounds arrive to the listener not quite syncronized. Also, there are multiple reflections.I have found a 1984 paper by noted acoustician Arthur Benade, PhD, titled "Wind Instuments In The Concert Hall." If you will go to this site: http://www-ccrma.stanford.edu/marl/Benade/ ... you will find this paper by scrolling down and clicking where it says Writings, and then finding 1984. In the 1984 section you may click on the hyperlink and read this paper, which should answer your questions much better than I can.In case you wonder about who the heck Benade is... I rub elbows with a number of instument designers, and his name is often invoked anytime the conversations gets technical... Benade says X, Benade says Y... well, you get the picture.

http://www-ccrma.stanford.edu/marl/Benade/

Subject: Re: Musical Instuments and Time Alignment
Posted by Wayne Parham on Sun, 11 Aug 2002 04:56:01 GMT
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I really appreciate your taking the time to post this information. The thread we discussed this on previously was called "Time alignment vrs reality", and other recent threads related to the subject include "Phase, delays and offset baffle spacing" and "Phase Delay and Group Delay".

Subject: Re: Musical Instuments and Time Alignment
Posted by bmar on Sun, 11 Aug 2002 21:36:55 GMT
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Hi Paul,Interesting paper. Thanks for taking the time to come back to this point. I get the impression Benade likes what they call now a live end dead end room. live for the orchastra and almost dead for the audience. He still likes a small amount of reverberation through the hall, but none that would come back to a musician carrying horrible delays. I'll have to read some more of his writings. Tha man liked to write! Bill

Subject: Re: Musical Instuments and Time Alignment
Posted by Paul C. on Sun, 11 Aug 2002 23:08:59 GMT
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Not really what Benade prefers, but what MUSICIANS prefer is that they can hear each other onstage. Ever see a rock band, or other big stage production where every musician has a monitor spkr in front of him? Well, imagine being on stage with 70-100 other musicians, there you are, you have a duet line with another musician across the stage 50' away from you, and you cannot hear him to play intune, you cannot hear him to syncronize rhythmically, etc. It is like playing by yourself. Same for the other guy. And pitch is not fixed. Non musicians see just 12 keys in an octave on the piano, but in reality, there are hundreds of pitches. A note will sound "consonant" or be harmonically in tune with other notes, only when it is a whole number ratio, and the difference frequencies produced from two different pitches played simulataneously is in tune with harmonics (whole number multiples) of either of the two notes. And when you have more complex harmonies, there are more possibilities.The ear tells the musician when he is in tune. Well, an A=440 works one way in the the key of C, another way in the key of D, and still another way in the key of E, etc. And it depends on what chord is being played with it. So, you might have to play that A at 440.7 hz, or maybe 439.5 or whatever. And it changes from second to second as you play.And if you cannot hear the other musicians, you cannot do this.I LOVE playing in a good band shell. Next, on a good stage with a ceiling from 20'-30' high, and not to deep from lip of stage to the back wall. And I don't want to be on an the apron stuck out past the curtains, but back under the lower ceiling so I can hear.A natural amount of echo and reverb in the hall itself is good, too, warms up the tone. But you want it to be at a low, just barely noticable level... it must give a little sustain to you sound, without being echo, or multiple echos. Many musicians will clap their hands in an empty hall (which gives no indication of how it will sound filled with bodies), and what they listen for is the clap to have a sustain to it, but not to hear the slap echoed.But, as one of my old musician buddies says (who played in the Chicago Theater in the 30's-40's), "Every body absorbs as much sound as a 5' open window, and when you put 5000 people in there, that is what the Chicago Theater held, you had better be able to BLOW, Man... 'cause if the guy in the last row of the balcony can't hear you, then you aren't doing your job!"Well, also in that paper was an explaination of how the overtones are fixed in position in relation to the fundamental. I have to agree with Wayne in what my ears tell me... while we can tolerate a considerable amount of frequency response anomalies (to the ear, this is like being in room A vs room B, each having different peaks and dips from room resonances), time alignment in speakers is not nearly as noticable as a big dip or peak at the crossover.

Subject: Re: Musical Instuments and Time Alignment
Posted by Paul C. on Sun, 11 Aug 2002 23:21:09 GMT
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Yes, I think we speak the same language. The time I spent in the sound lab in college, playing with the early, crude ARP synth, parametric equalizers, etc, really taught me a lot about how the ear (and brain!) works. And I just recently started wading through Benade's papers. If I find anything else in these papers that might be applicable here, I will post it.