

### The Just Noticeable Difference:

The Just Noticeable Difference (*JND*, in *dB*) in our human hearing is  $JND \simeq \Delta L_p \sim 0.5 \text{ dB}$ .

However, the *JND* in our human hearing is frequency dependent **.and.** also sound pressure level/*SPL*-dependent, as shown in the figure below:

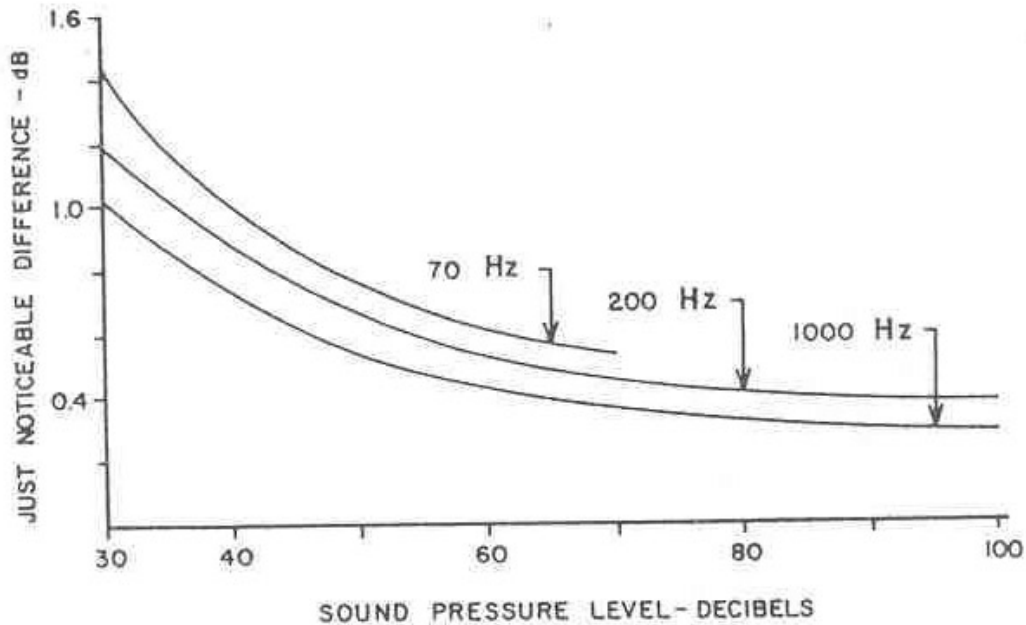


FIG. 2. Just noticeable difference in sound pressure level for three frequencies.

**Question(s):** Why do we humans hear in the frequency range that we do (20 Hz – 20 KHz)?  
 Why do we not hear in the lower/higher frequency ranges (< 20 Hz, > 20 KHz)?

It is not at all an accident that we hear in the frequency range that we do! We humans, as social animals, are primarily interested all-things human (as other social animals are primarily interested in their own species) – and hence we are primarily interested in hearing human-made sounds – as produced by our own voice(s). The frequency range of sounds produced by our own voice(s) – the totality of the physics associated with air as a medium + vibrating vocal chords in our larynx/voice box + hyoid bone + acoustic cavities of our lungs + throat + mouth + nasal passage/sinus cavity dictates what the acoustic power spectrum of the human voice can/cannot be. Hence over the millions of years of our evolution, our hearing co-evolved with the sounds that our voices make.

It is also not at all an accident that our ears are tuned to be especially sensitive *e.g.* to the sounds/cries produced by our infants and our young in the ~ 1 → few KHz range.

It is also no accident/a good thing that we do not hear too well in the infra-sound ( $f < 20 \text{ Hz}$ ) region – because it would have been/would be significantly detrimental to us if our hearing was constantly being “masked” by hearing draft/wind noises as we were walking and/or running!