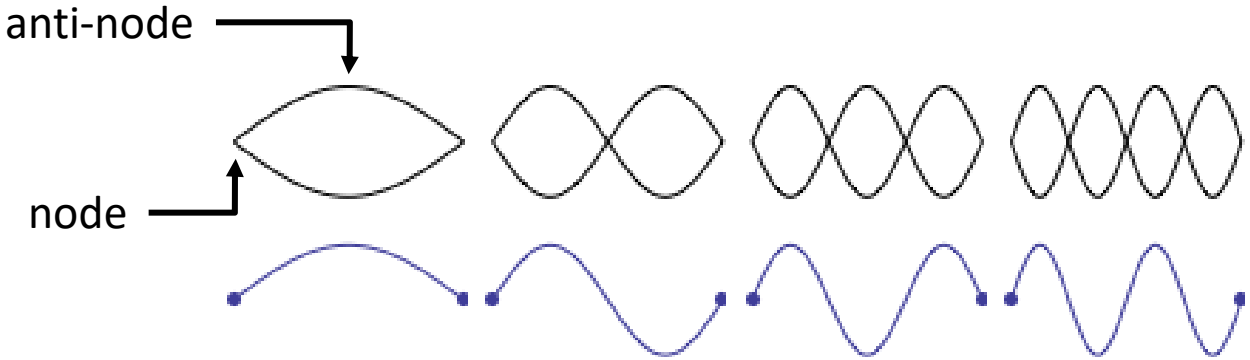
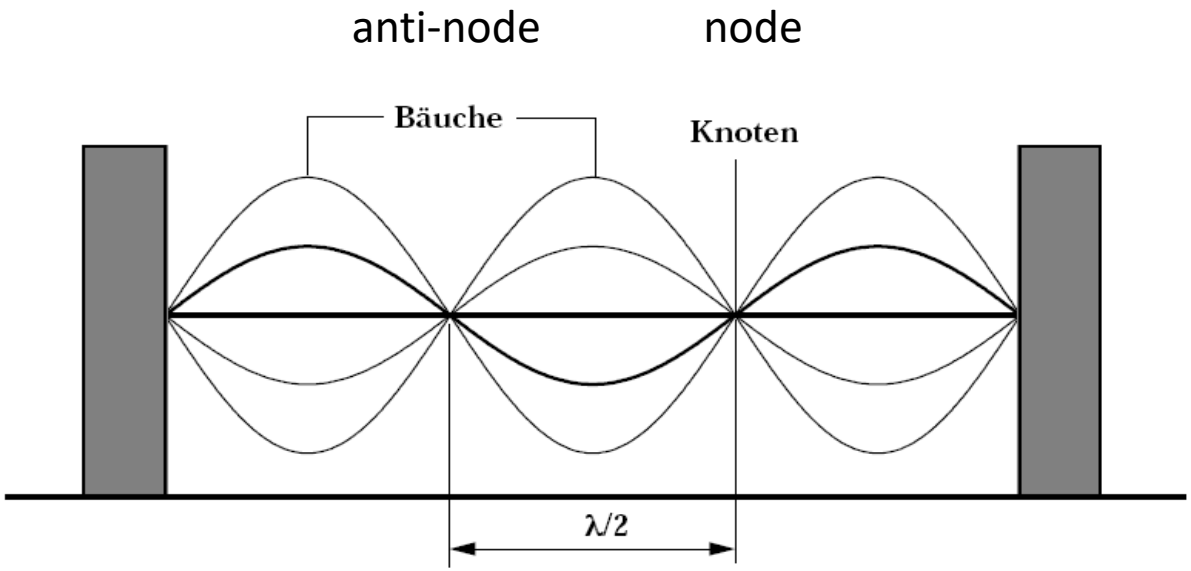
Waves III

Introduction to Physics I

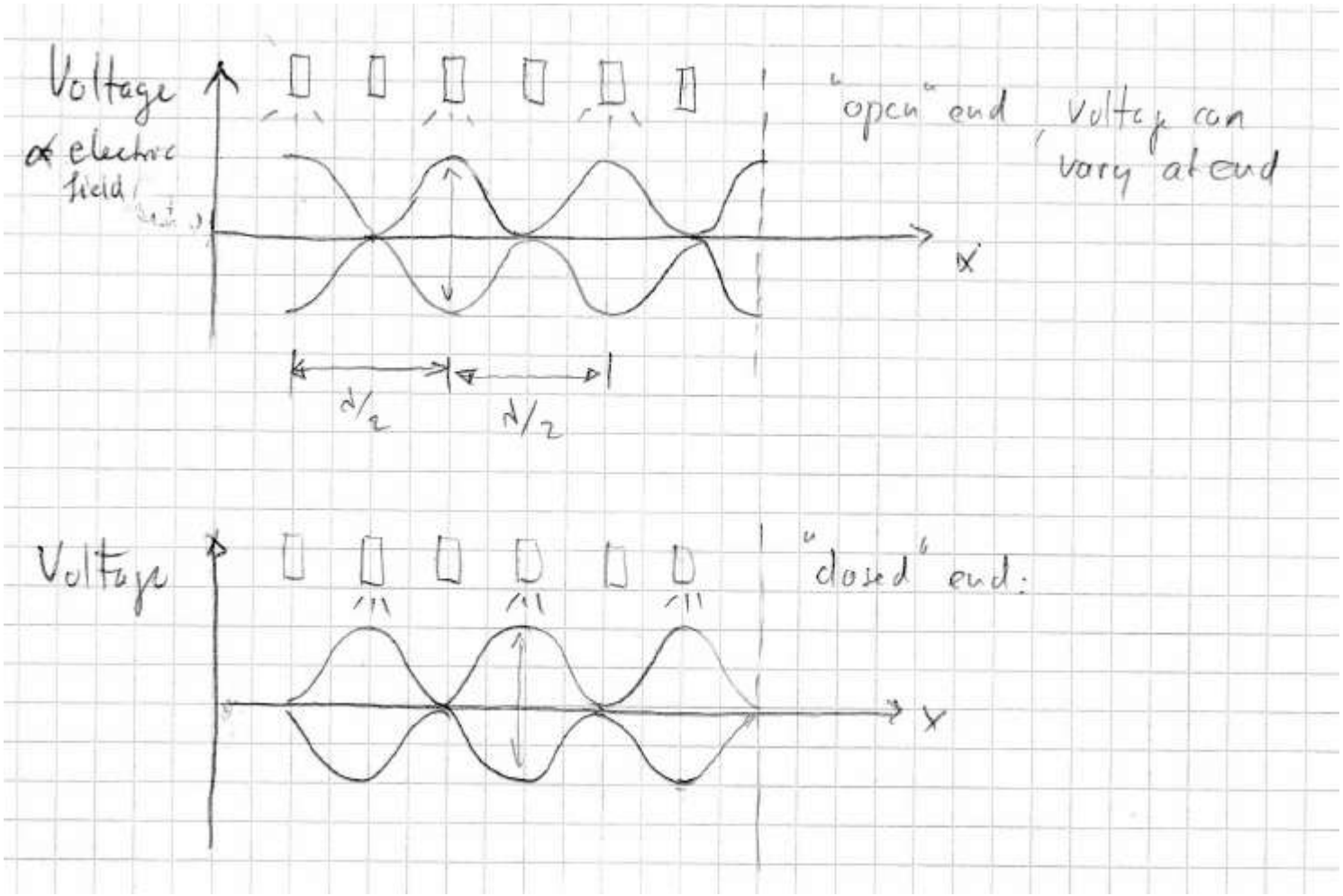
For Biologists, Geoscientists, & Pharmaceutical Scientists

standing waves





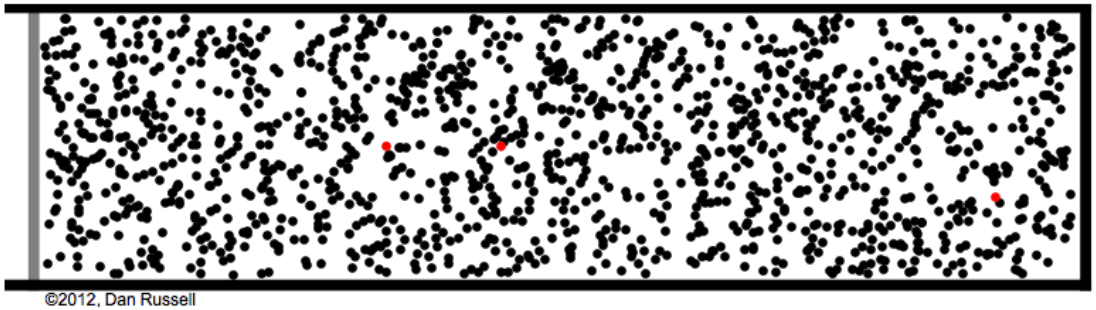
standing waves

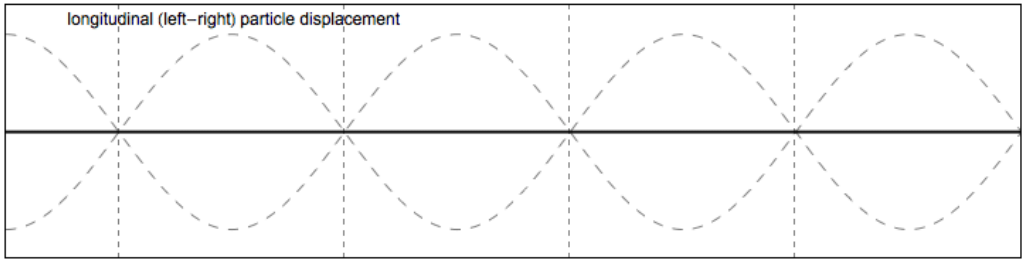


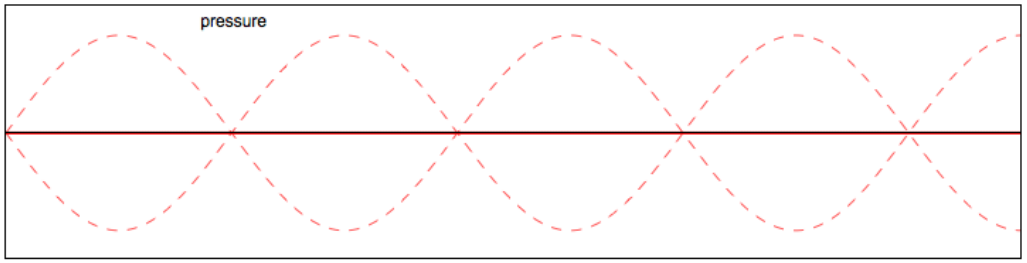
Exp.: Lecher wires

standing waves

sound wave in a pipe that is forced (by a moving piston or loudspeaker) at the left end and closed at the right end







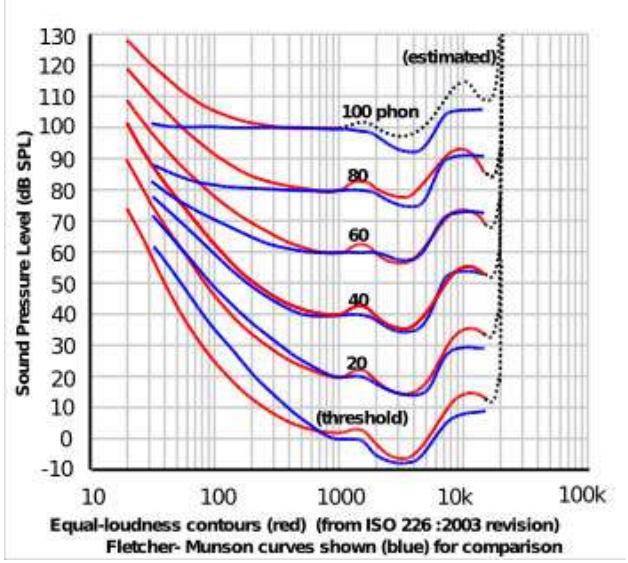
https://www.acs.psu.edu/drussell/Demos/StandingWaves/StandingWaves.html

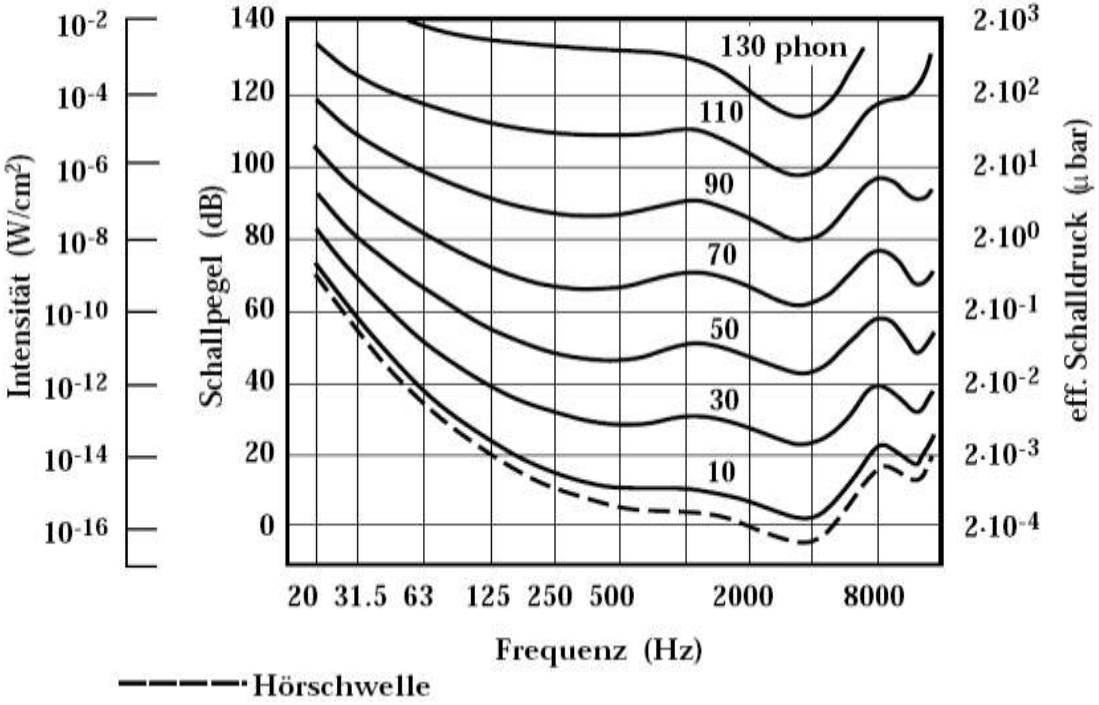
Sound intensity levels

Sound intensity level (dB)	**Intensity *I* (W/m^2)**	**Example/effect**
0	1×10^{-12}	**Threshold of hearing at 1000 Hz**
10	1×10^{-11}	Rustle of leaves
20	1×10^{-10}	Whisper at 1 m distance
30	1×10^{-9}	Quiet home
40	1×10^{-8}	Average home
50	1×10^{-7}	Average office, soft music
60	1×10^{-6}	**Normal conversation**
70	1×10^{-5}	Noisy office, busy traffic
80	1×10^{-4}	Loud radio, classroom lecture
90	1×10^{-3}	Inside a heavy truck; damage from prolonged exposure
100	1×10^{-2}	Noisy factory, siren at 30 m; damage from 8 h per day exposure
110	1×10^{-1}	**Damage from 30 min per day exposure**
120	1	Loud rock concert, pneumatic chipper at 2 m; threshold of pain
140	1×10^{2}	Jet airplane at 30 m; severe pain, damage in seconds
160	1×10^{4}	**Bursting of eardrums**

https://courses.lumenlearning.com/physics/chapter/17-3-sound-intensity-and-sound-level/

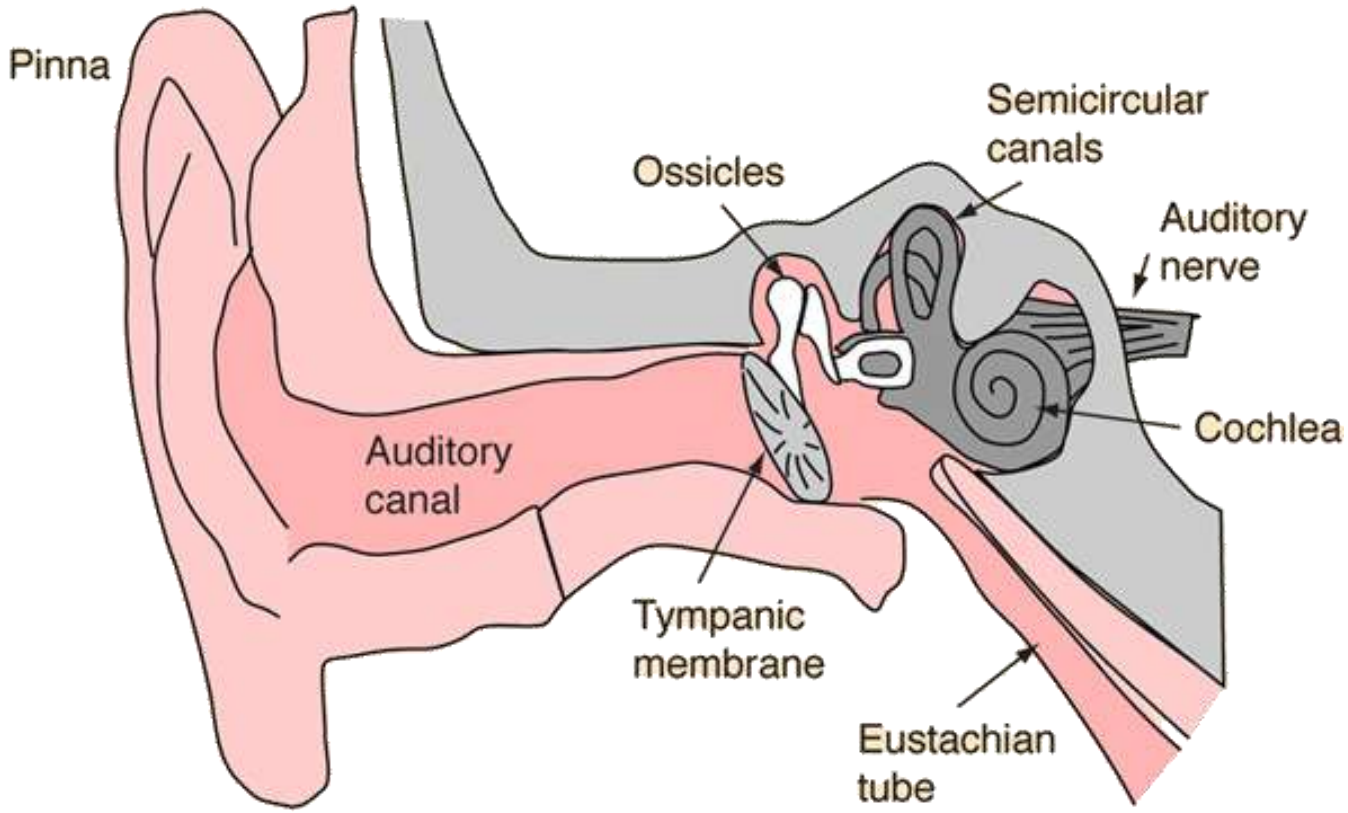
Loudness





At low frequencies, more sound wave intensity is required to lead to the same perception of sound intensity as at higher frequencies

human ear



http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/ear.htm