

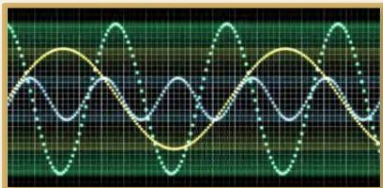
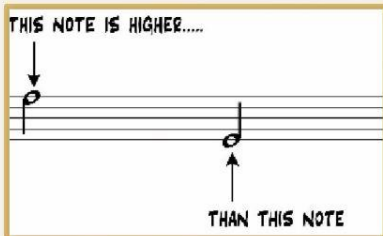
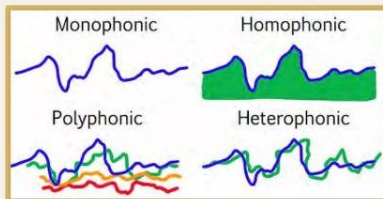
Lecture 1.1 Sound & Acoustics

MUS/COGS 20 Exploring the Musical Mind

Summer Session II 2025

Instructor: Jingwei Liu | August 5, 2025

MUSICAL DOMAINS & EMERGENCE



SEMIOTIC/SOCIAL/CULTURAL
(aesthetics, musicology, critical theory)
behaviors, values, meanings, metaphors, etc.

MENTAL
(cognition)
form, tonality/scale systems, melodic and metric organization, etc.

PERCEPTUAL
(psychoacoustics)
pitch, loudness, timbre, basic rhythmic categories, etc.

PHYSICAL
(acoustics)
frequency, amplitude, spectrum, attack and decay, etc.

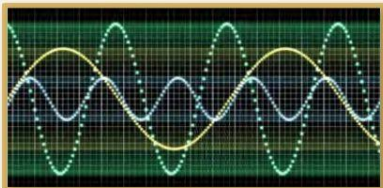
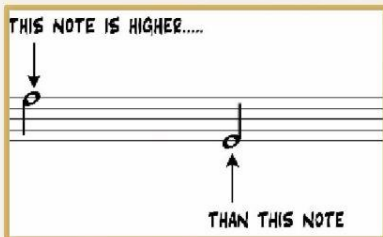
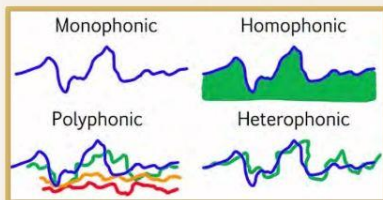


Physical Acoustics

The Science of Sound

- [Springer Handbook of Acoustics](#)
- [Physics of Sound YouTube Playlist](#)
- [Digital Signal Processing YouTube Playlist](#)
- [Auditory Processing YouTube Playlist](#)

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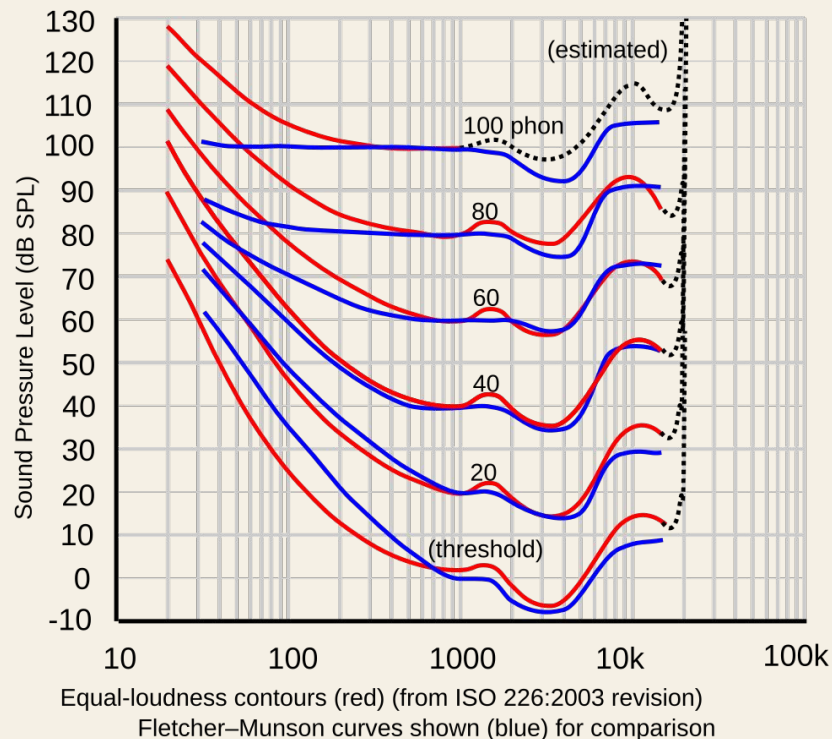
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Psychoacoustics

Equal-loudness Contour

- An equal-loudness contour is a measure of sound pressure level, over the frequency spectrum, for which a listener perceives a constant loudness when presented with pure steady tones.
- Two sine waves of differing frequencies are said to have equal-loudness level if they are perceived as equally loud by the average young person without significant hearing impairment.



Musical Illusions ([Diana Deutsch's Research](#))

Speech-to-Song Illusion



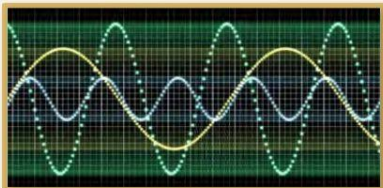
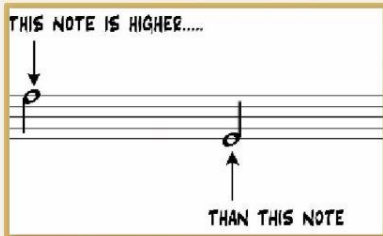
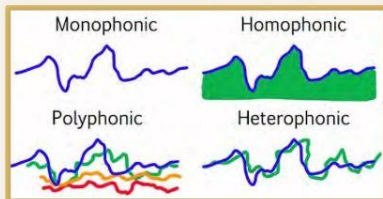
- The Speech-to-Song Illusion was discovered by Deutsch in 1995
- She had the phrase ‘*sometimes behave so strangely*’ on a loop, and noticed that after a number of repetitions, the phrase sounded as though sung rather than spoken.
- “*In our final demonstration, speech is made to be heard as song, and this is achieved without transforming the sounds in any way, or by adding any musical context, but simply by repeating a phrase several times over.*” – Diana Deutsch



YouTube Video: Why we really really really like repetition in music

Rhythm/Pitch Duality: hear rhythm become pitch before your ears

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Sensory systems are not scientific instruments that objectively measure physical attributes like mass or temperature. Instead, our brains format the signals that comprise the physical world so they have meaning to us. Making sense of sound is profoundly governed by how we feel, think, see, and move. Conversely, hearing influences how we feel, think, see, and move.

– *Of Sound Mind: How Our Brain Constructs a Meaningful Sonic World.* Nina Kraus, Professor of Neuroscience. Northwestern University

YouTube Video: Explained | Music | FULL EPISODE | Netflix