



Actually the Science of Music – Supplement 1



Beat Frequencies

The word “beat” used here is not the musical beat of, say, your favourite tune.

It’s a scientific meaning:

In acoustics, a beat is an interference pattern between two sounds of slightly different frequencies, heard as a periodic variation in volume whose rate is the difference of the two frequencies.

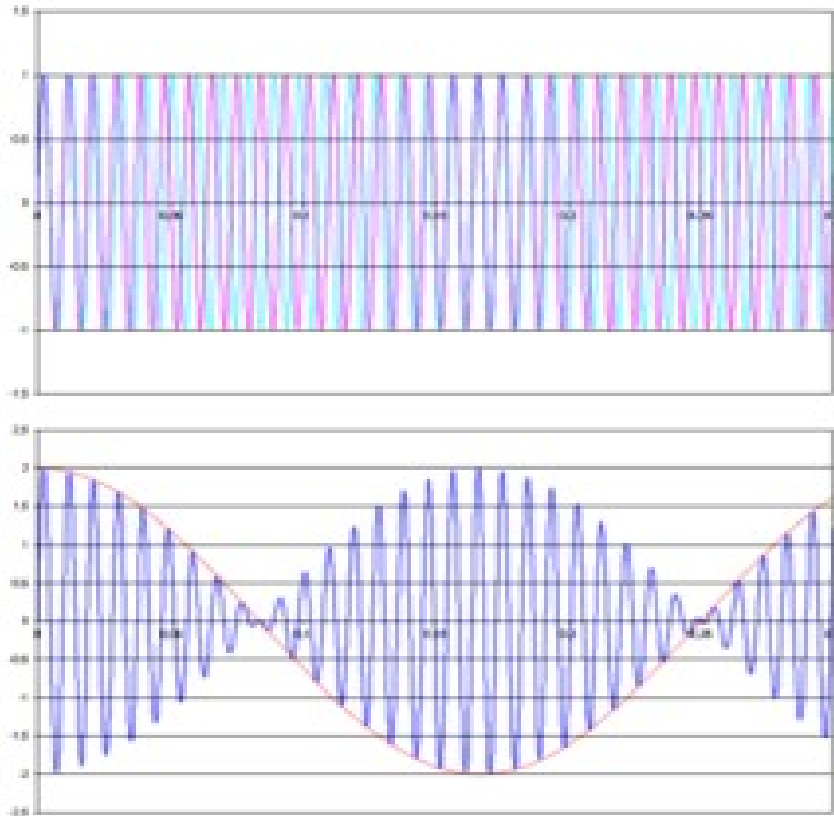
The link below shows an animation of such wave interference

[https://en.wikipedia.org/wiki/Beat_\(acoustics\)#/media/File:WaveInterference.gif](https://en.wikipedia.org/wiki/Beat_(acoustics)#/media/File:WaveInterference.gif)

The link below is a 110 Hz A sine wave (magenta; first 2 seconds), a 104 Hz G Sharp sine wave (cyan; following 2 seconds), their sum (blue; final 2 seconds) and the corresponding envelope (red)

https://en.wikipedia.org/wiki/File:Beat_-_superposition_of_104hz_and_110hz_sine_waves.ogg

The image below shows what it looks like.



Audio Effects

1. Risset Rhythms Jean-Claude Raoul Olivier Risset (13/3/1938 – 21/11/2016) French composer

Risset Rhythms create the illusion of continually changing tempos by increasing/decreasing the tempo, while fading between multiple rhythms with related tempos.

https://en.wikipedia.org/wiki/File:Risset_accelerando_beat1_MCLD.ogg

<https://www.youtube.com/watch?v=VR06wf2LF5o>

https://www.youtube.com/watch?v=oQf_tS5WAP4

2. Doppler Effect Christian Andreas Doppler (29/11/1803 – 17/3/1853) Austrian physicist

The observed frequency of a wave (including sound and light) depends upon the relative speed of the source and the observer.

The link below includes a sound demonstration

[Link to wikipedia](#)

3. Pitch Circularity

A sound appears to forever go up or down in frequency (pitch)

[Link to website](#)

4. The Haas Effect

Link - 40 second clip

<https://www.izotope.com/en/learn/what-is-the-haas-effect.html>

Sound demonstration link below:

Same levels but appears to come from the right speaker