The Sound

Math and perception: because we like the sound


WHAT IS IT?

- The sound (from the Latin *sonus*) is a wave (time series of physical processes) given by the vibration of a body in oscillation. This vibration, which propagates in the air or another fluid, is perceived by the apparatus auditory ear that, through a complex internal mechanism, creates a "hearing" feeling related to the nature of the vibration; especially the tympanic membrane undergoing pressure changes enter into vibration, the vibrations transmitting to the brain.


FEATURES

The height of the sound and the frequency

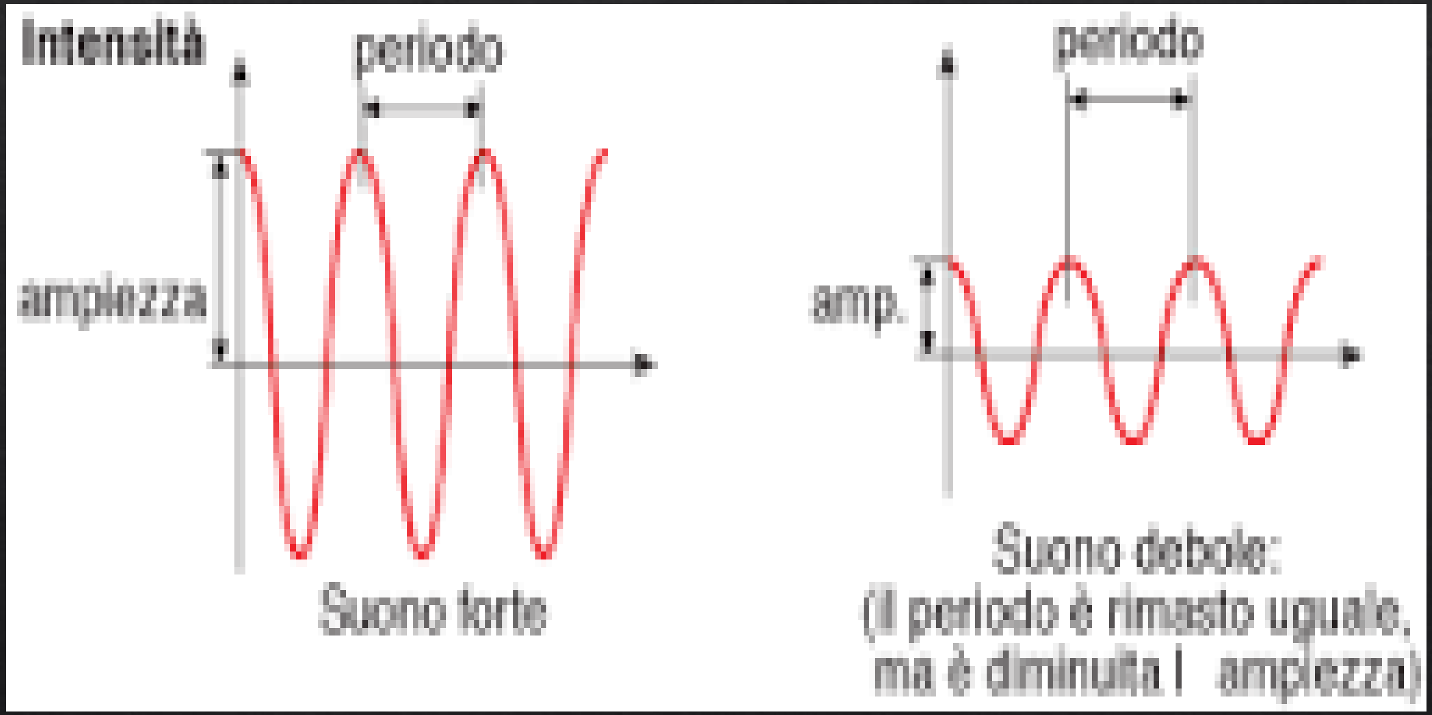
Not all elastic bodies vibrate in the same way: depending on their characteristics may produce, in the same interval of time, more or less vibration. If we place a microphone, connected to a computer, near a sound source can view the waveform of the sound.

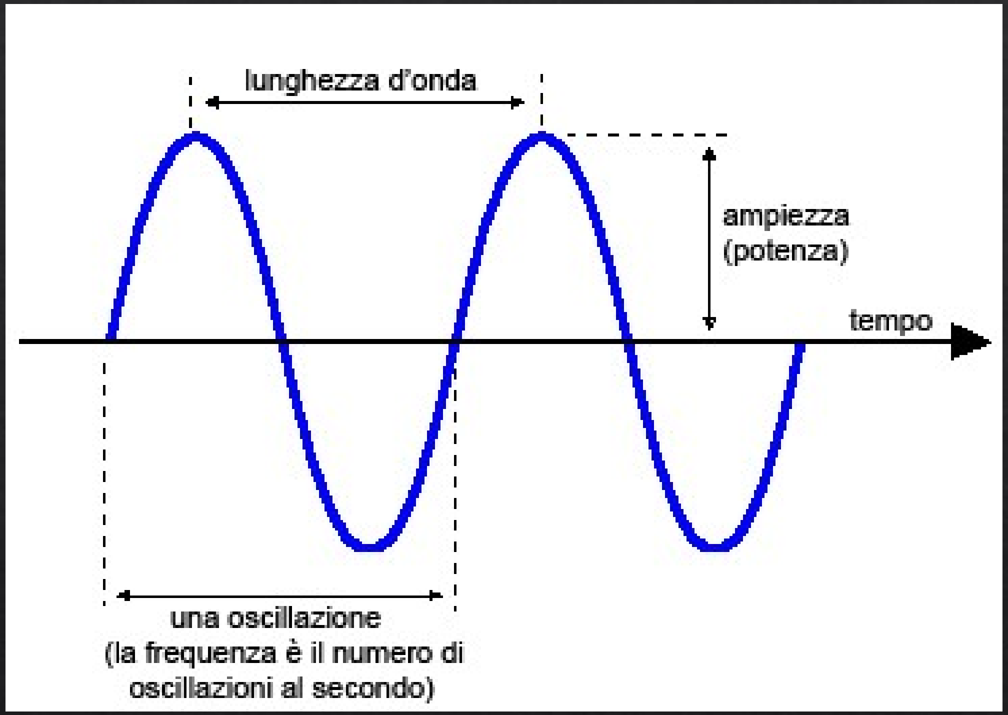
A Each moment in a complete flip (return): counting periods will count the vibrations. At a high number of periods, that is, of vibrations, said match or high-pitched sounds, at a low number of vibrations match said sounds serious or lower. In the acoustic vibrations are measured in **Hertz (Hz**), the number of vibrations produced in a second is defined **frequency.**

Character of the sound so far examined is said height, precisely because it allows us to determine when the sounds are high (acute) and when they are low (severe). The intensity of a sound depends on the greater or lesser energy with which it is produced. **The intensity** characteristics are:

1. be directly proportional to the amplitude of the vibrations (and therefore the force with which the sound is produced) ;
2. be inversely proportional to the distance between the listener and the sound source: the greater the distance, the lower the intensity with which the sound is perceived. All sound characteristics, namely timbre, pitch and intensity, only this' last it is also present in the noise, as it is the only character not tied to the number and regularity of the vibrations, but only to their amplitude. The intensity of a sound or a noise is measured in decibels.

Sound Characteristics illustration





CYMATICS

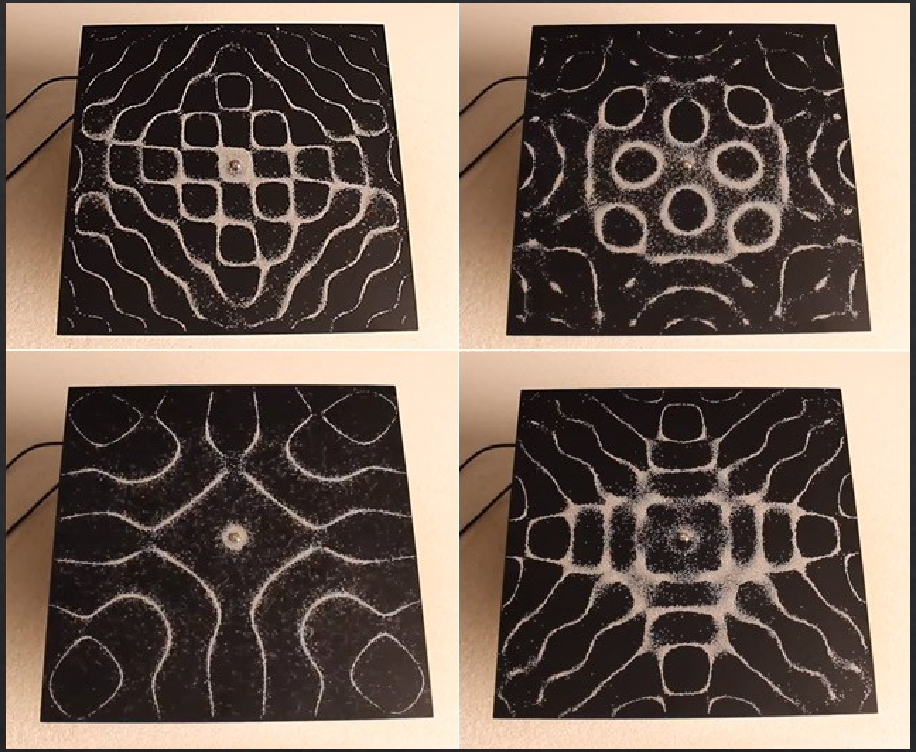
The term cymatics designates a theory, due to the Swiss scientist Hans Jenny, trying to prove a morphogenetic effect of sound waves. Cymatics The name was coined by Hans Jenny, meaning "study of the waves." He argued that there is a subtle power through which the sound structure of matter. In his experiments he placed sand, dust and fluids on a metal plate connected to an oscillator which produced a broad spectrum of frequencies. Sand or other substances were organized in different structures characterized by typical geometrical shapes of the frequency of the vibration emitted by the oscillator. According to Jenny these structures, reminiscent of the mandalas and other recurring forms in nature, would be the manifestation of the invisible force of the vibrational field and each form contains information about the vibrations that have generated.

Cymatics and sound experiment:

The cymatics experiment is probably the most basic and simple way to see cymatics in action.

Take a flat sheet of metal, either circular or square, and mount on a central stalk to a sturdy base. Then sprinkles fine sand or salt on top of plate. Hold the plate with your finger or thumb at a point on the edge. Begin to stroke the side of the plate with a Cello or Violin bow. The plate will ring loudly if you manage to excite a mode of vibration!

The sand will begin to bounce about on the plate until settling at nodal points (areas of zero movement) thereby producing intricate patterns. Where the bow strokes in relation to your finger will dictate which mode of vibration you excite. For simplicity, maybe start by holding a corner of the square plate, stroking the middle of a side, or stroke the circular plate 45° around from your finger.



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