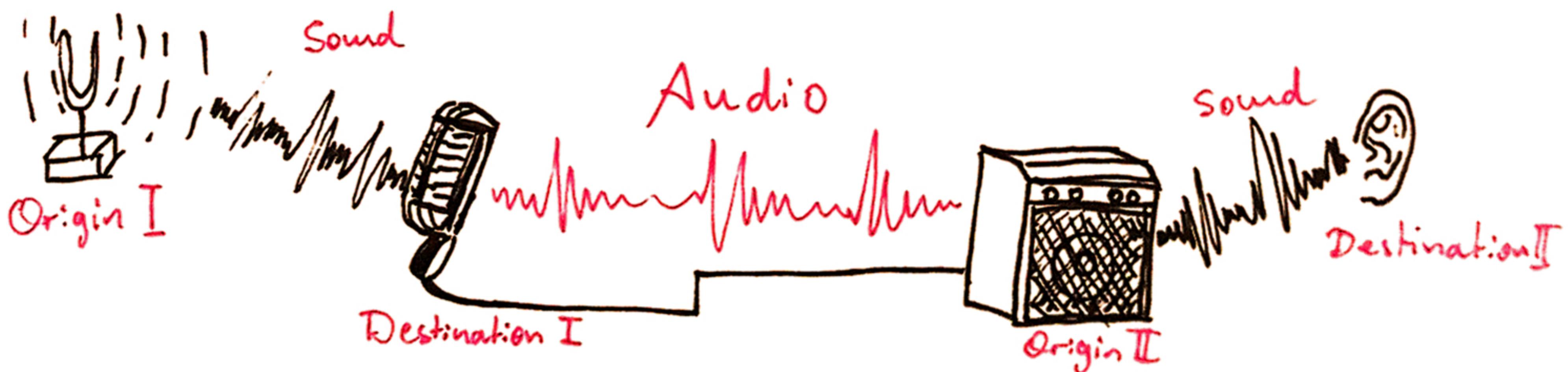


# Sound and Audio

The **Sound** is a Set of mechanical waves that are longitudinal. The object that originates the sound produces a vibration that propagates through a medium, modifying the local pressure of particles that they create over time.



The **Audio** is an electromagnetic signal represents and transports sound information. The audio and sound are therefore physically different. Audio allows the transmission of sound by making travel through electronic equipment.



- Reproduction of prerecorded sounds and non-automatic recording (1X century)
- Automatic recording of arbitrary sounds, but impossible to reproduce (1857) **Fonautografo**
- Reproduction and recording of arbitrary sounds (1877). **Fonografo**

# Wave

Energy shift that is not associated with the movement of matter. A wave is a disturbance of a physical quantity that propagates over time, transporting energy or momentum.

- Classification:
- Regard to the propagation medium
  - Regard to the direction of movement of the particles
  - Regard to the form
  - Regard to the periodicity

## Mechanical Wave

The disturbance affects particles of matter. In order for propagation to take place, therefore, a medium is used in gas, liquid or solid form.

## Electromagnetic Wave

The perturbation (disturbance) affects electromagnetic quantities, in particular the variation of electric and magnetic fields. It can propagate in a vacuum.

### Longitudinal wave

 Spring

The disturbed particles move along the same propagation direction of the wave (parallel or longitudinally)

### Transverse wave



The disturbed particles move along the direction perpendicular to that of wave propagation (transversely).

# Waveform

The waveform is the graph that describes the amplitude of wave as a function of time.

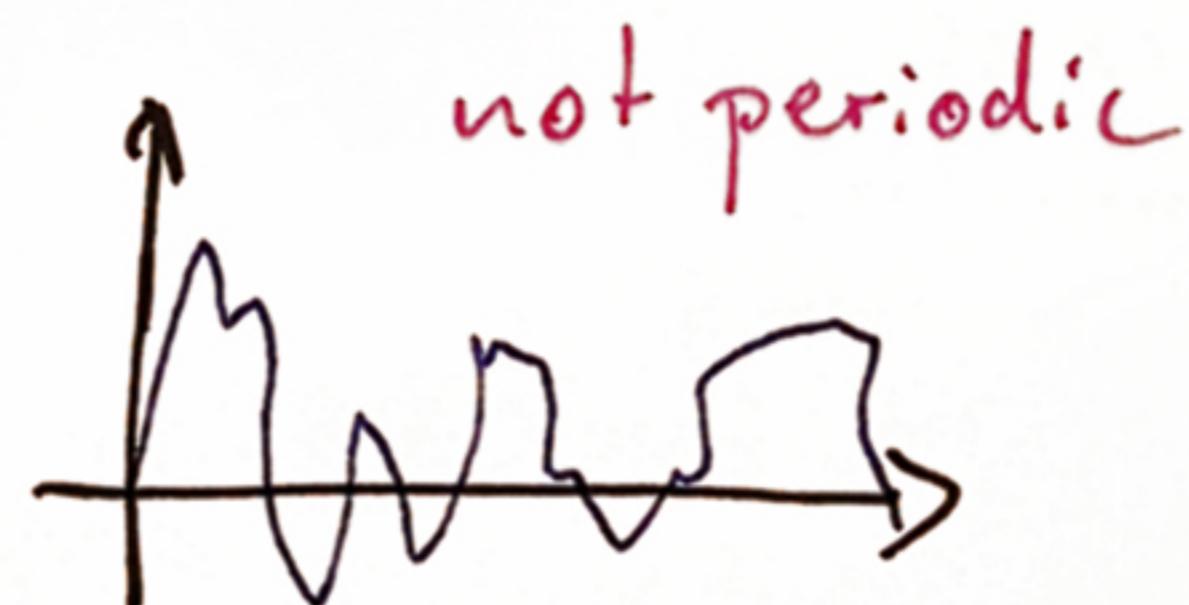
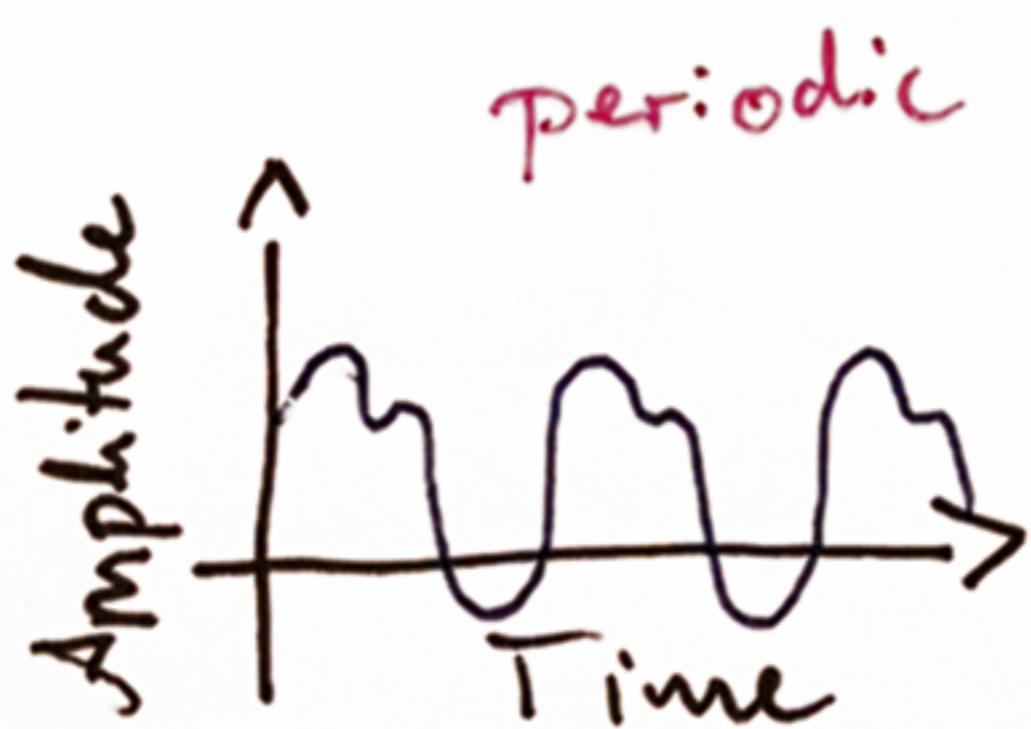
**Sine wave:** The relation between time and wave intensity is described by the sine wave. Therefore the waveform corresponds to the graph of the sine function.

**Other waves:** Although for some function that describes them is known, most of the waves have a generic form.

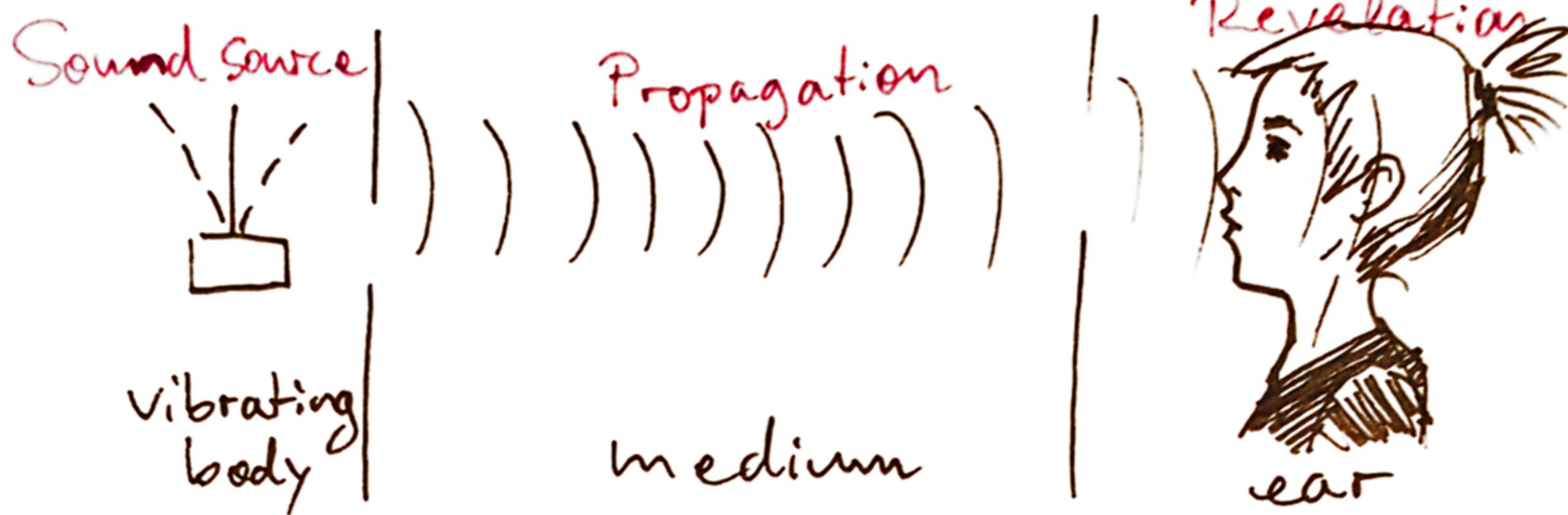
# Periodicity

A wave is called **periodic** and of period  $T$  if it is constituted by a sequence of oscillation which are repeated at regular intervals and equal to  $T$ . It can be written mathematically...

A wave is **aperiodic** or **not periodic** if there can't be found a regularity in the oscillations. It's often difficult to write through a mathematical function, but if it's possible ~~is~~ a non-periodic function is used.



# Vibration, Propagation, Revelation



Amplitude, Period, Frequency, Phase, Wavelength

Amplitude : • Sound intensity — Sound volume (whisper vs scream)  
• Proportional to the energy carried by the wave

Frequenza : Height of sound. High vs Low

Phase : Vibrational state of a wave  
spatialization of sound

