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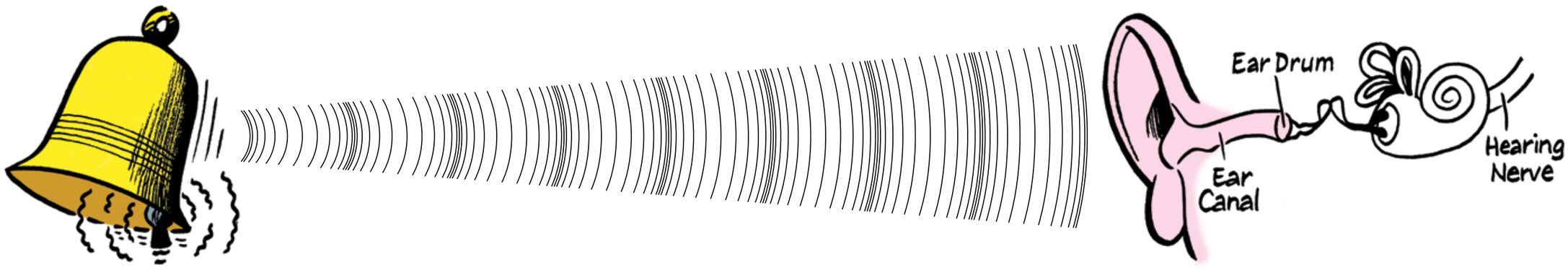
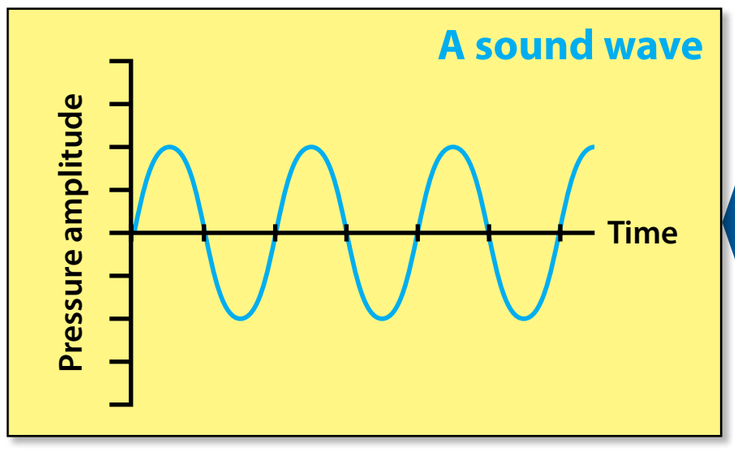
# What is sound?

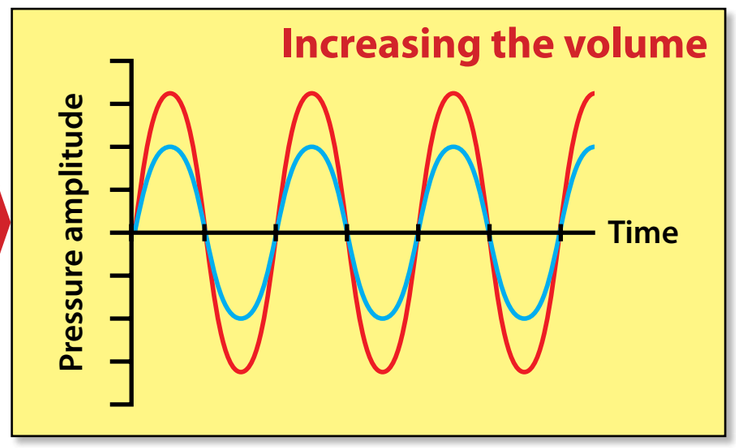
**Sounds** are caused when an object, the **source** of the sound (e.g. a bell), vibrates. The vibration spreads through the surrounding **medium** (e.g. the air particles). These vibrations, called **sound waves**, are detected by a **receiver** (e.g. the ear). Particles in the medium do not travel the full distance between source and receiver, but oscillate about the rest position as the wave passes by. In a way it is like a mexican wave passing through a football crowd – the supporters do not travel around the stadium but the wave does.

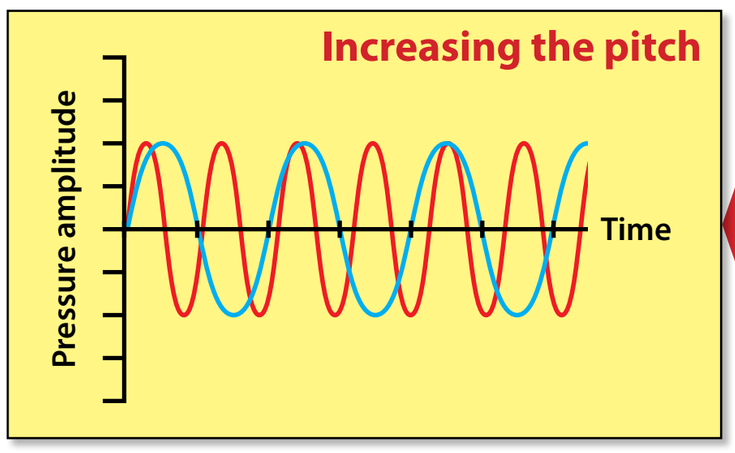



**Sound waves** travel through different materials – solids, liquids or gases - but not through a vacuum, as there are no particles to oscillate. The sound wave can be plotted, with the x-axis representing time and the y-axis the variation in **pressure** (as the particles are compressed and decompressed by the passing wave).

The difference in pressure **(amplitude)** of two sounds is perceived by our ear as a difference in loudness or **volume.** Loud (high volume) sounds are the result of large pressure oscillations as the wave travels through a medium.




Changes in the **frequency** of the wave are perceived by our ears as a change in **pitch**. The frequency of the sound is the number of pressure oscillations each second. It is measured in Hertz (Hz). 1 Hz = 1 oscillation per second. Increasing the frequency of the sound increases the pitch that we hear.

The general frequency range of hearing for young people is 20 Hz to 20 kHz (=20 000 Hz). The upper frequency limit decreases with age, and so the older a person gets, the less well they can hear high pitch sounds. Animals hear in different frequency ranges to humans: generally, larger animals hear lower frequencies and smaller animals hear higher frequencies.

**Acoustics** is the science that measures, characterises, quantifies and describes sound.


## Did you know?

The National Physical Laboratory (NPL) accurately measures sound in air, at frequencies higher than we can perceive (ultrasound) and even through water. Ultrasonic sound is used in medical imaging (such as ultrasound scans), and a range of other medical and industrial applications.

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