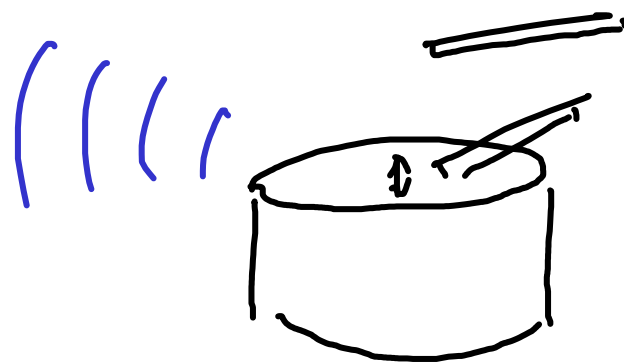
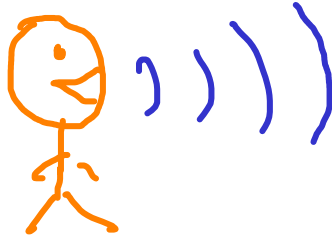


Production of Sound

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Vibration - rapid to and fro motion
- disturbs air
- sound wave

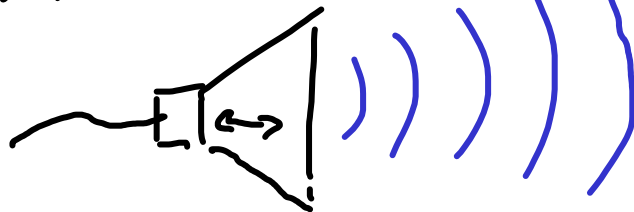
vibrating
vocal
cords



hitting drum,
vibrate

changing
electric current

vibration

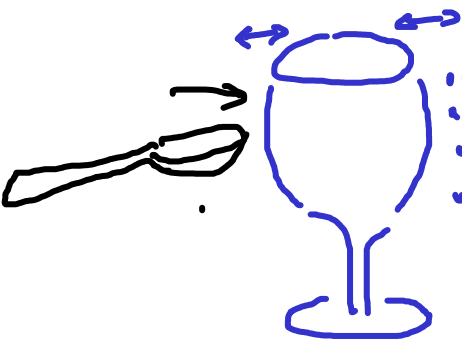


hitting a
glass
vibrate

Compression, Rarefaction

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Vibration -



Air molecules

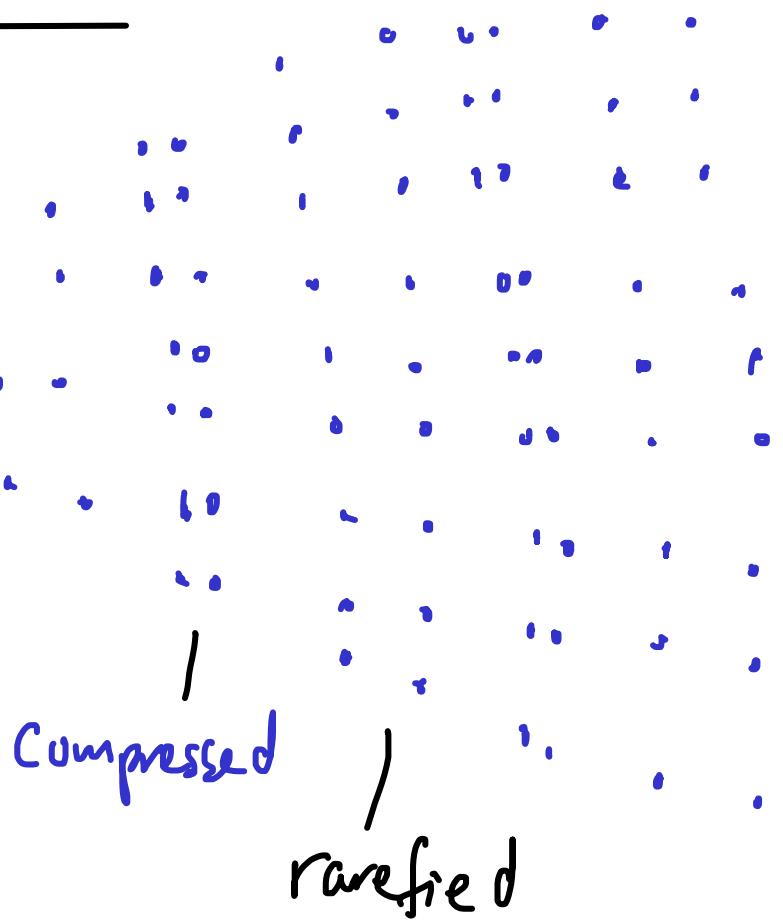
Next to vibration

compressed - rarefied (decompressed)

repeatedly

as disturbance travels out

Sound wave

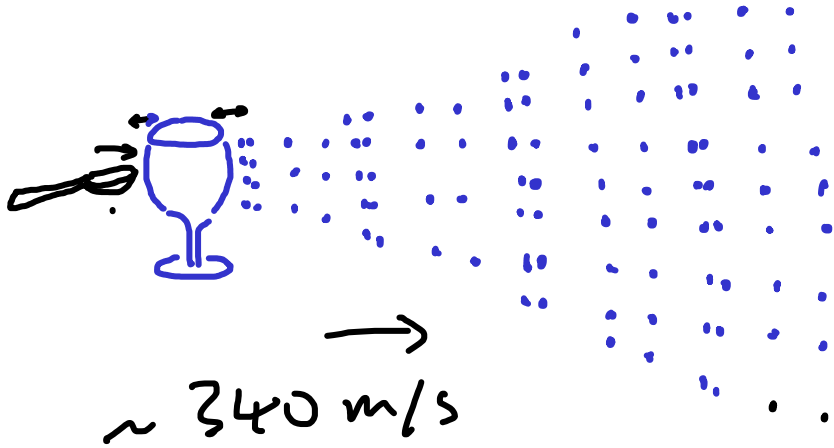


explain that a medium is required in order to transmit sound waves and the speed of sound differs in air, liquids and solids

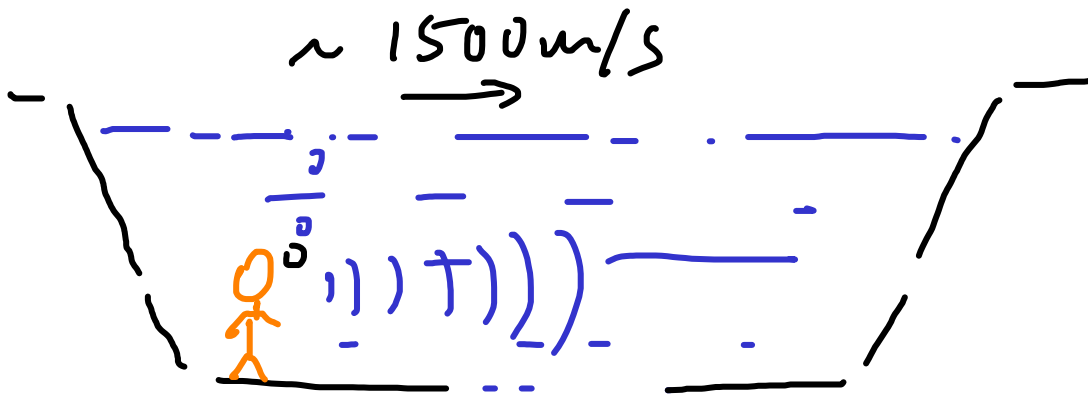
Medium

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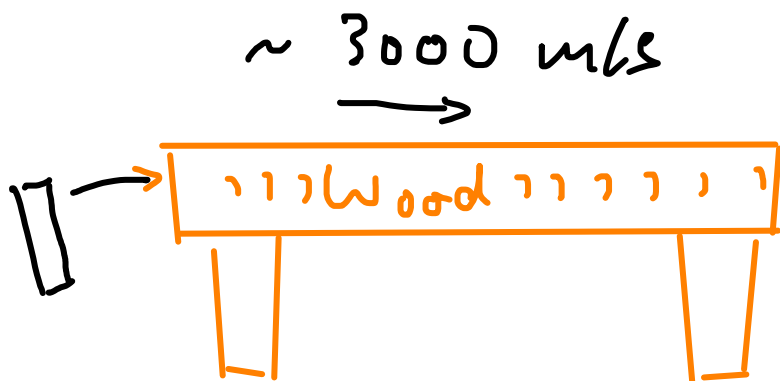
Unlike light, microwave, Xray,
Sound needs a medium to travel, like



gas
e.g. air



liquid
e.g. water

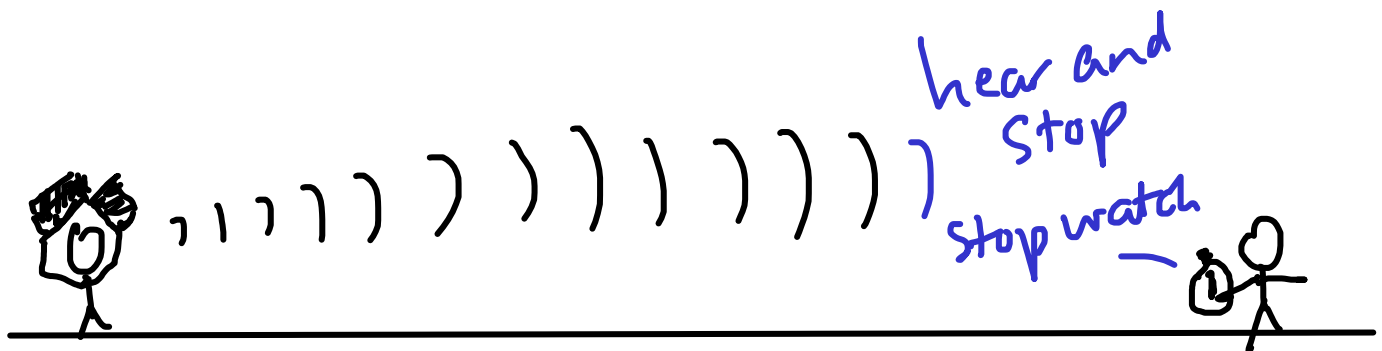
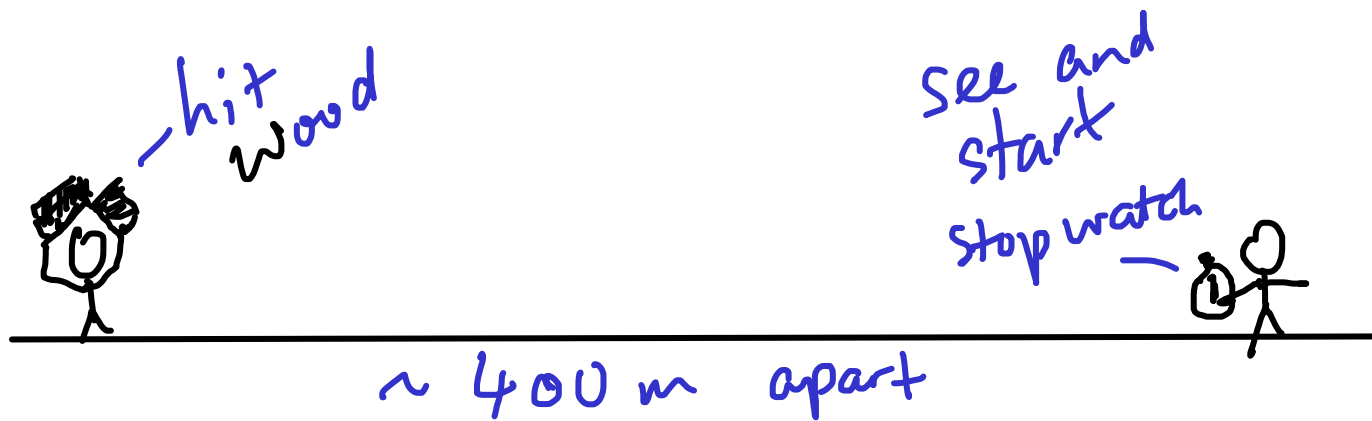
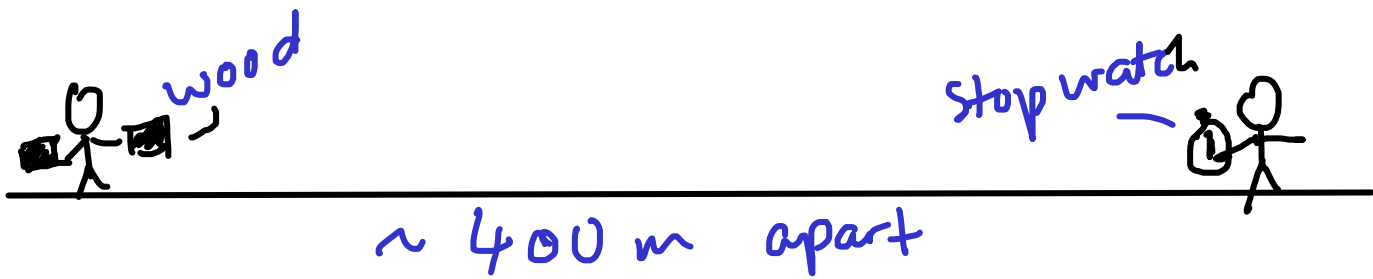


solid
e.g. iron

describe a direct method for the determination of the speed of sound in air and make the necessary calculation

Measuring Sound Speed

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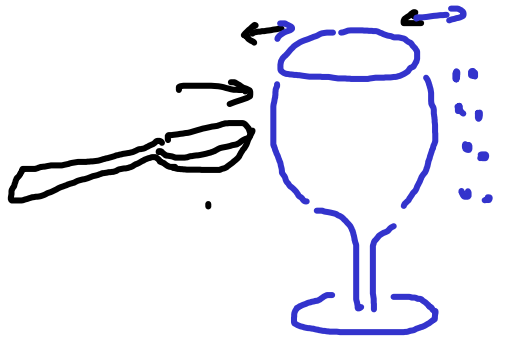
$$\text{Sound Speed} = \frac{\text{distance}}{\text{time taken}}$$

Assume - light much faster than sound
- time to see hitting wood much shorter than time to hear sound
- so can ignore

Loudness

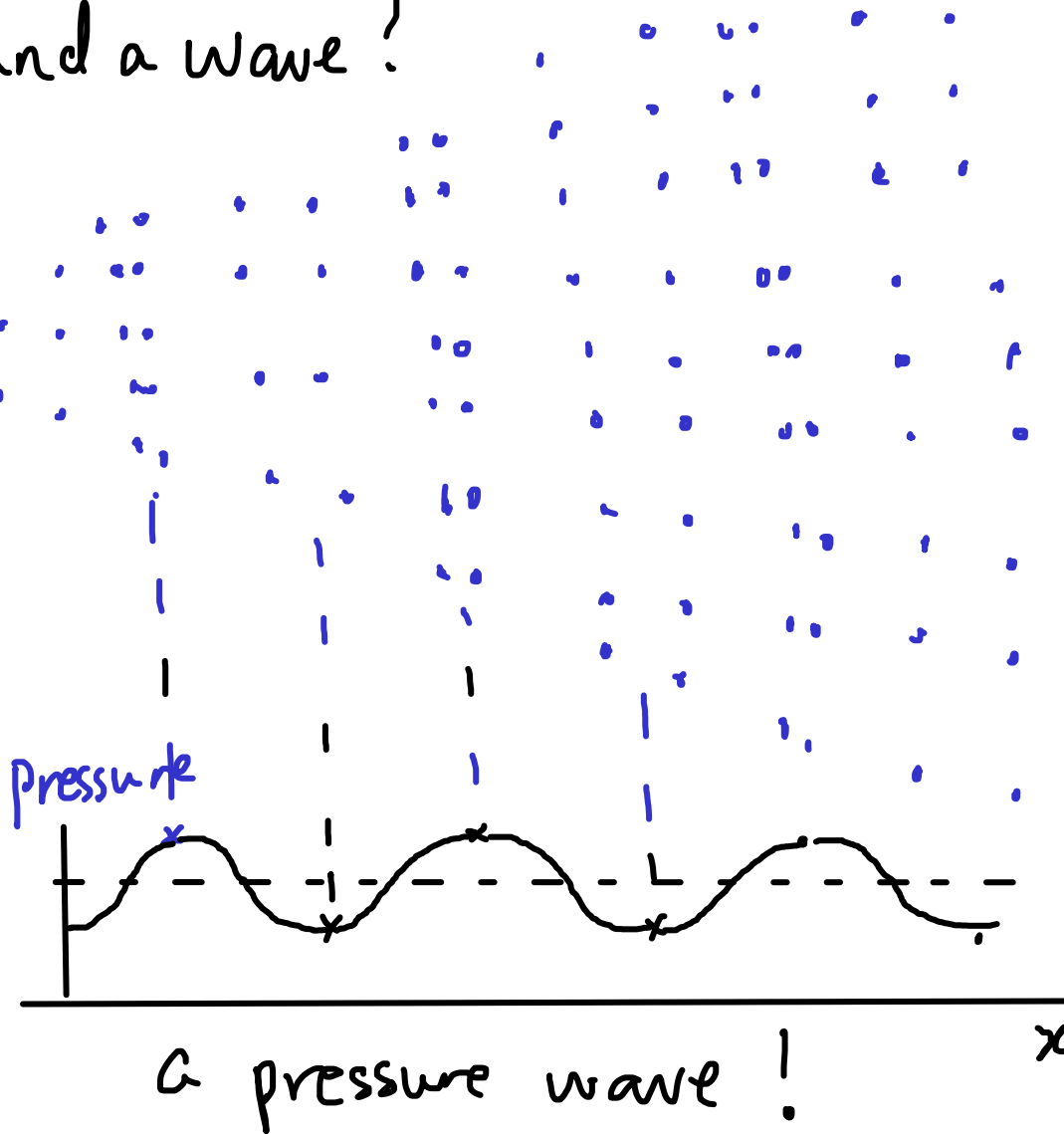
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Why is sound a wave?



looks nothing like a wave ☹️

Plot graph:



Amplitude = maximum change from normal pressure

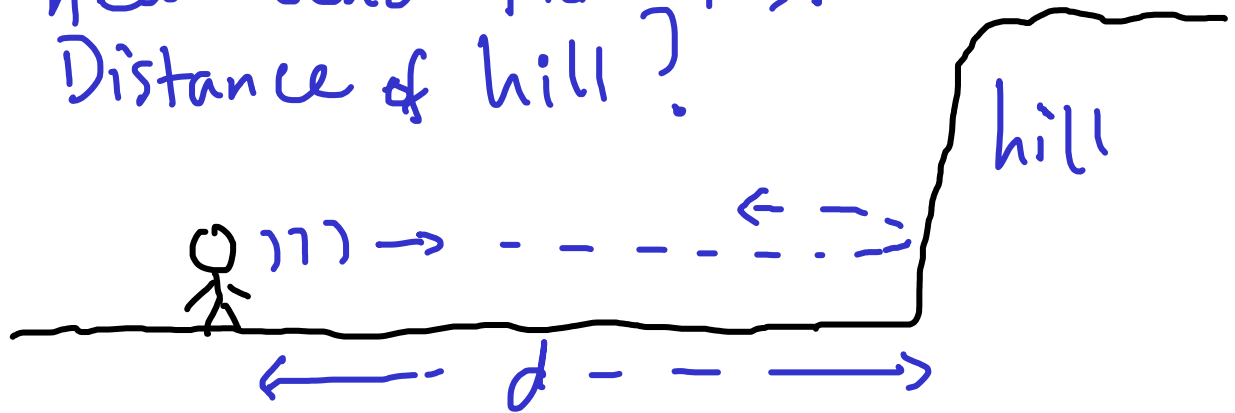
Louder sound \leftrightarrow higher amplitude
Higher pitch \leftrightarrow higher frequency

describe how the reflection of sound may produce an echo, and how this may be used for measuring distances

Echo

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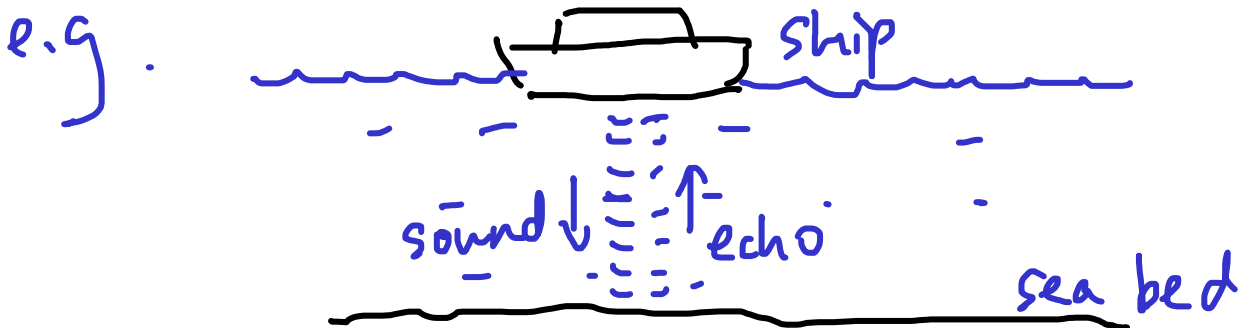
e.g. - hears echo after 4 s.
Distance of hill?



Distance travelled by sound = $2d$

$$\text{speed} = \frac{\text{distance}}{\text{time}} \rightarrow 340 \text{ m/s} = \frac{2d}{4 \text{ s}}$$

$$d = \frac{340 \times 4}{2} = 680 \text{ m.}$$



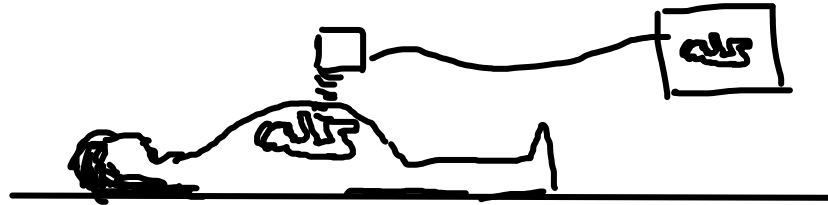
A "ping" sound sent underwater takes 10s to return an echo. How deep is the sea bed?

Ultrasound

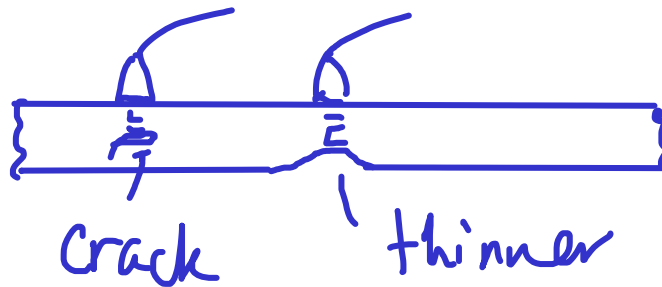
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frequency higher than human can hear
 $> 20\,000\text{ Hz}$.

e.g. Imaging. e.g. of unborn baby



e.g. metal sheet



Quality Control

e.g. Finding distances - SONAR.

