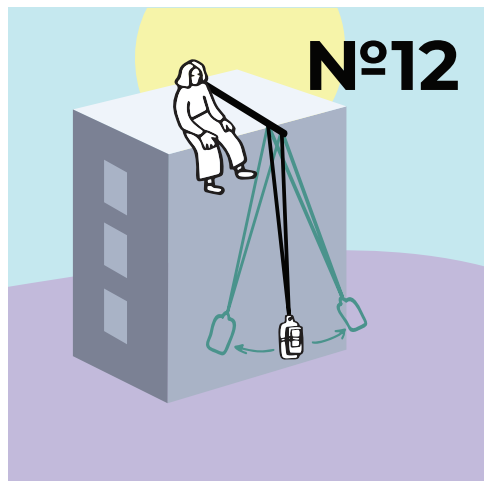
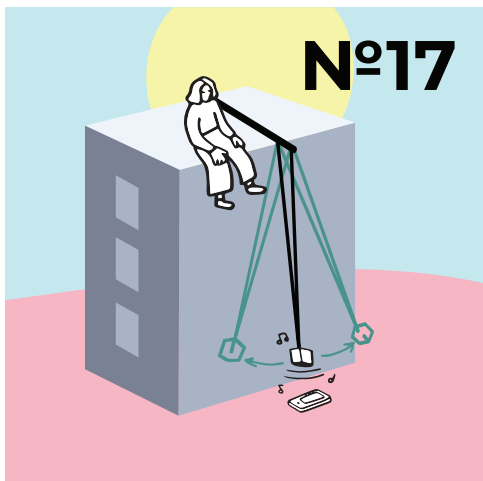


Challenge

GIANT PENDULUM

Get inspired by Galileo and measure the height of a building... using a smartphone!



Discover The Smartphone Physics Challenge at VULGARISATION.FR

«Physics Reimagined» team (Paris-Saclay University)



Precision: maximum



Difficulty: intermediate

Nº10. Giant Pendulum Timed

Formula

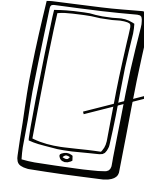
$$H = g \left(\frac{T}{2\pi} \right)^2$$



1 long rope

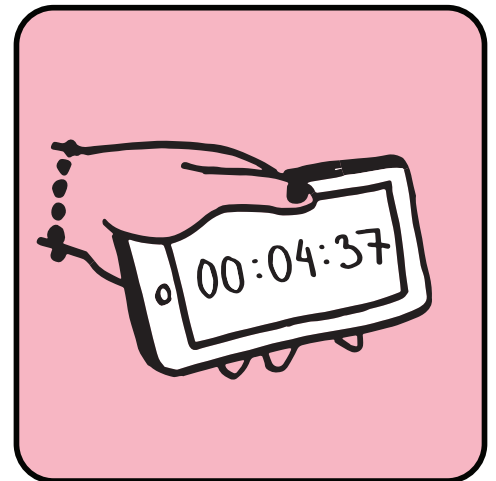
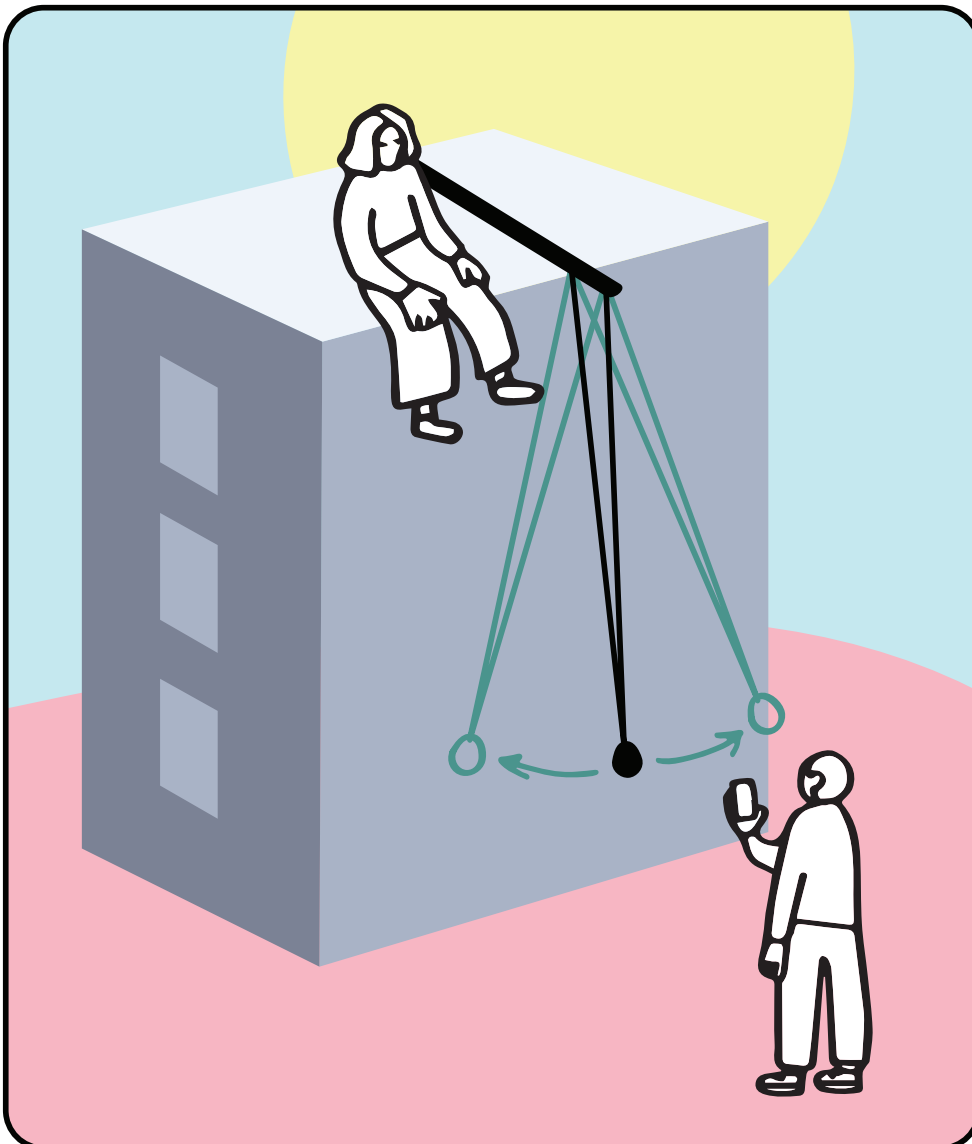


1 mass



1 smartphone

Sensor:
stopwatch



Make a giant pendulum the size of the building. Use the smartphone timer to determine the period.

T = pendulum period,
 $g = 9.8 \text{ ms}^{-2}$

The pendulum must not rotate in all directions, it must only swing.



Precision: low



Difficulty: intermediate

Nº12. Giant Pendulum & Accelerometer

Formula

$$H = g \left(\frac{T}{2\pi} \right)^2$$

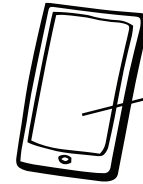
Material



1 long rope

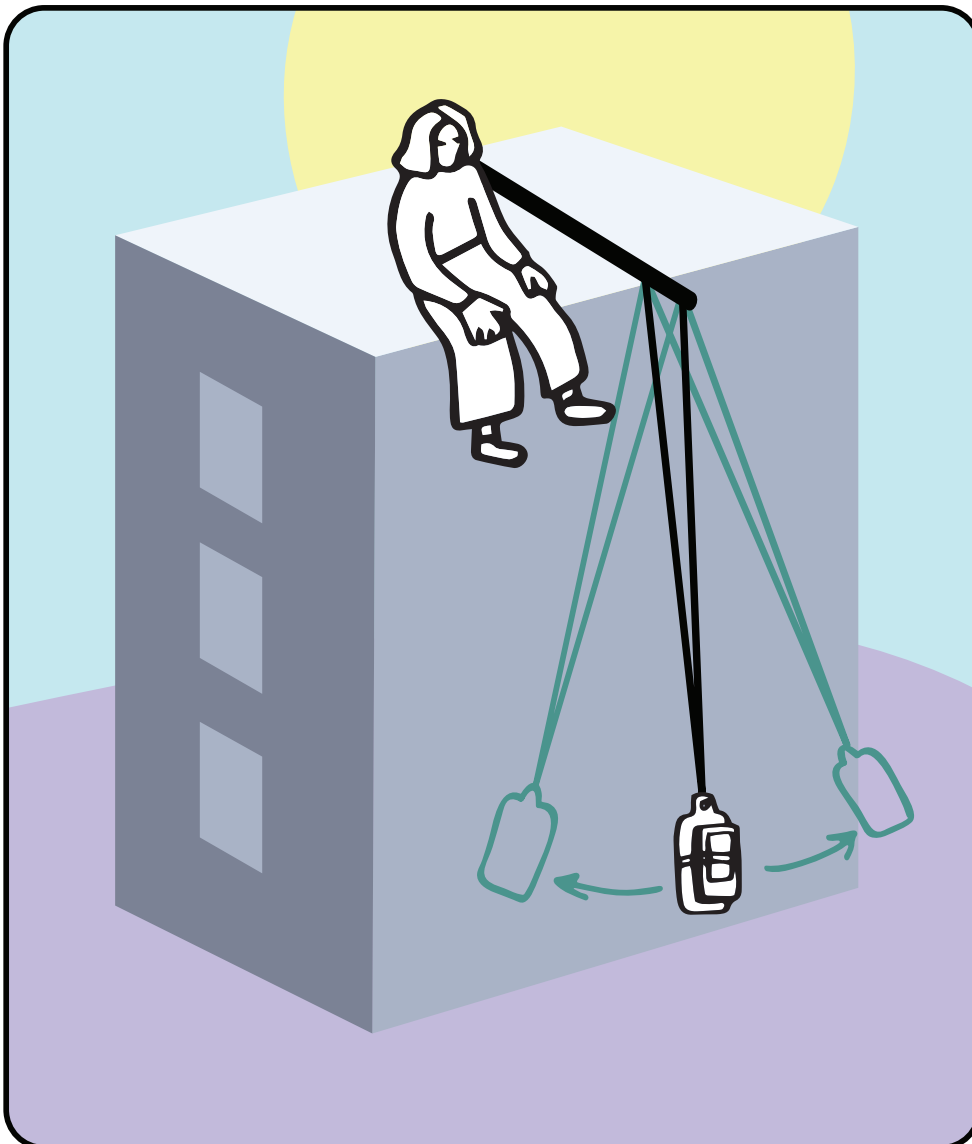


1 mass

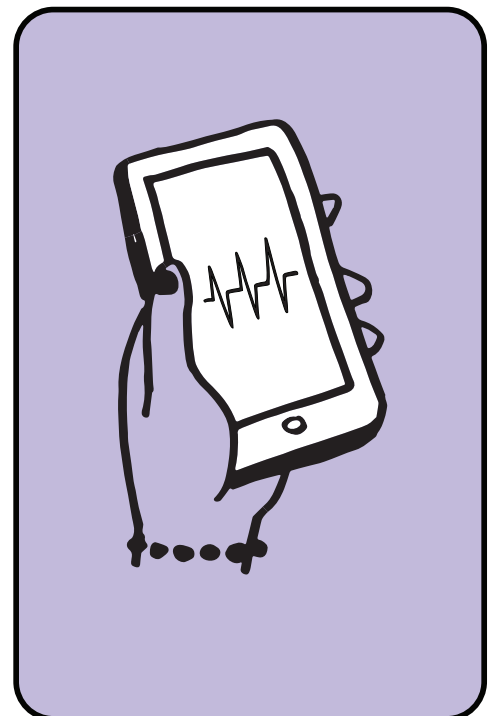


Sensor:
accelerometer

1 smartphone



Make a giant pendulum the size of the building. Attach the smartphone to the pendulum, and use the accelerometer to determine the period.



T = pendulum period,
 $g = 9.8 \text{ ms}^{-2}$

The higher the building, the smaller the acceleration, and the harder the measure will be.



Precision: high



Difficulty: intermediate

Nº14. Giant Pendulum & Magnet

Formula

$$H = g \left(\frac{T}{2\pi} \right)^2$$



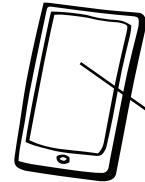
1 long rope



1 mass

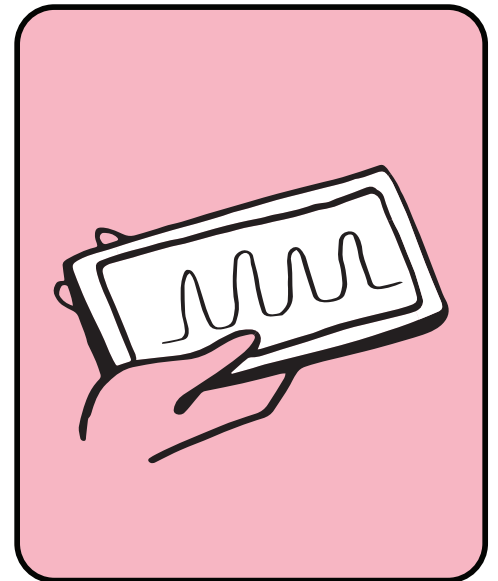
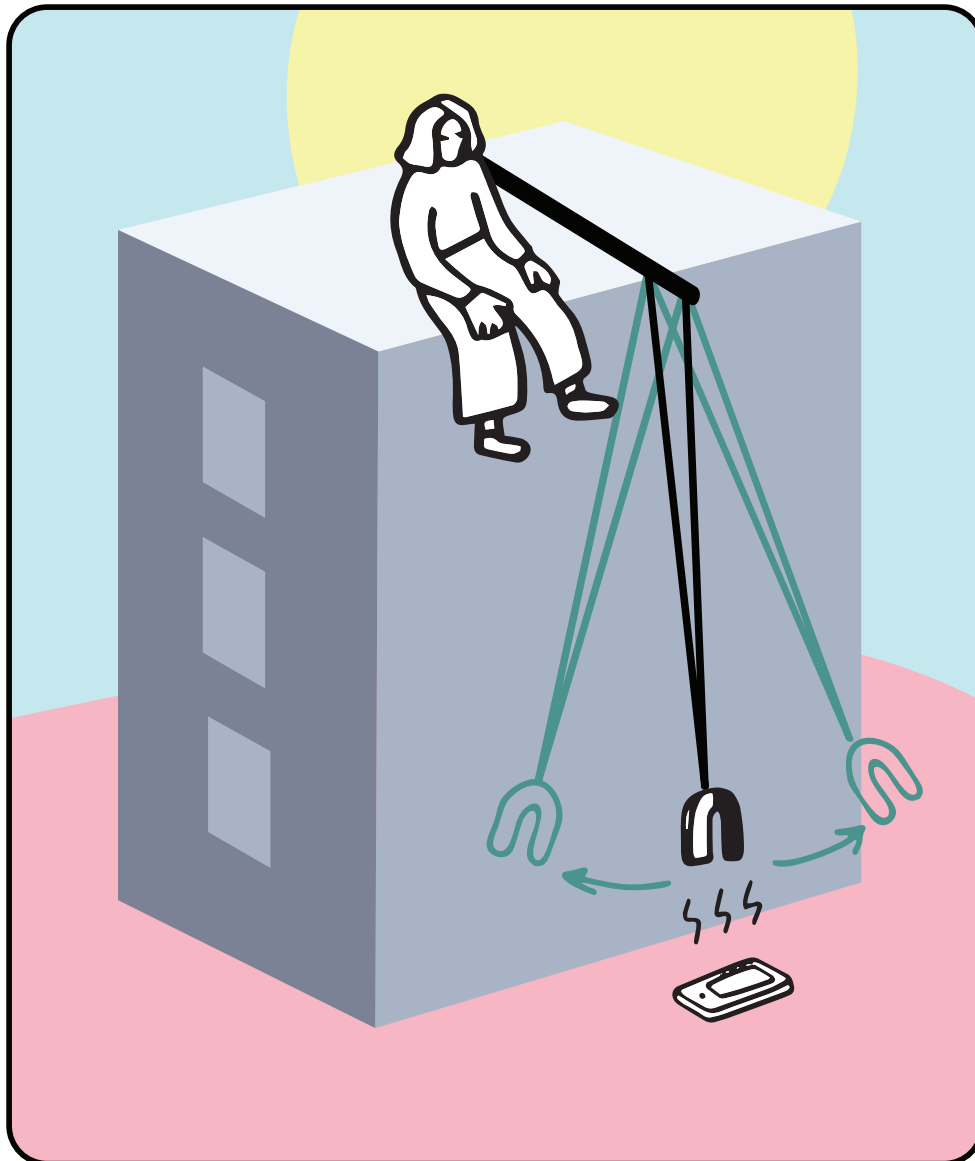


1 magnet



1 smartphone

Sensor: **magne-
tometer**



Make a giant pendulum the size of the building. Attach a magnet to the pendulum. Position the smartphone vertically to detect the passage of the magnet.

T = pendulum period,
g = 9.8 ms⁻²

The Earth's magnetic field can be used in place of the magnet; the smartphone must then be fixed on the pendulum.



Precision: high



Difficulty: intermediate

Nº15. Giant Pendulum & Light

Formula

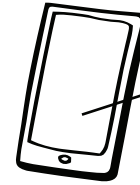
$$H = g \left(\frac{T}{2\pi} \right)^2$$



1 long rope



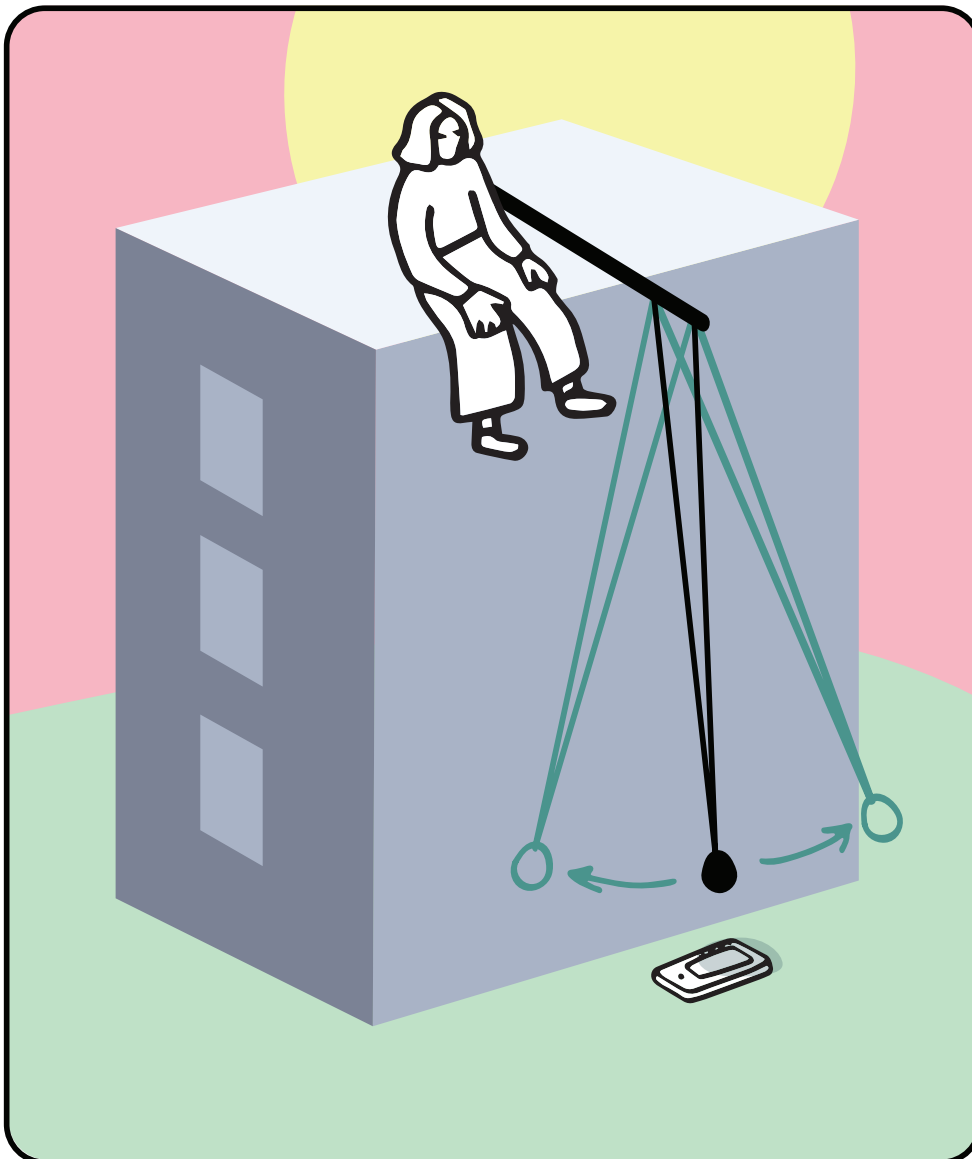
1 mass



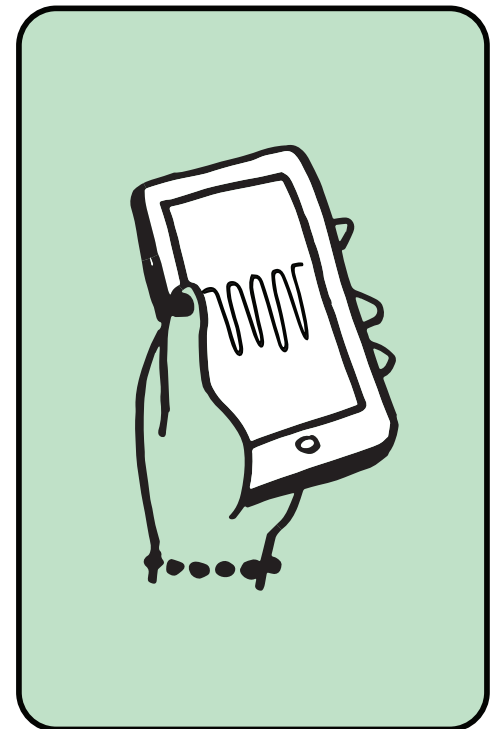
Sensor:
light sensor

1 smartphone

Material



Make a giant pendulum the size of the building. Position the smartphone vertically to detect the shadow of the pendulum.



T = pendulum period,
g = 9.8 ms⁻²

The pendulum must not rotate in all directions, it must only swing.



Precision: high



Difficulty: intermediate

Nº17. Giant Pendulum with Sound

Formula

$$H = g \left(\frac{T}{2\pi} \right)^2$$

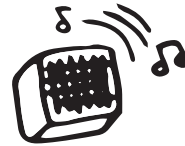
Material



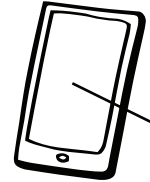
1 long rope



1 mass

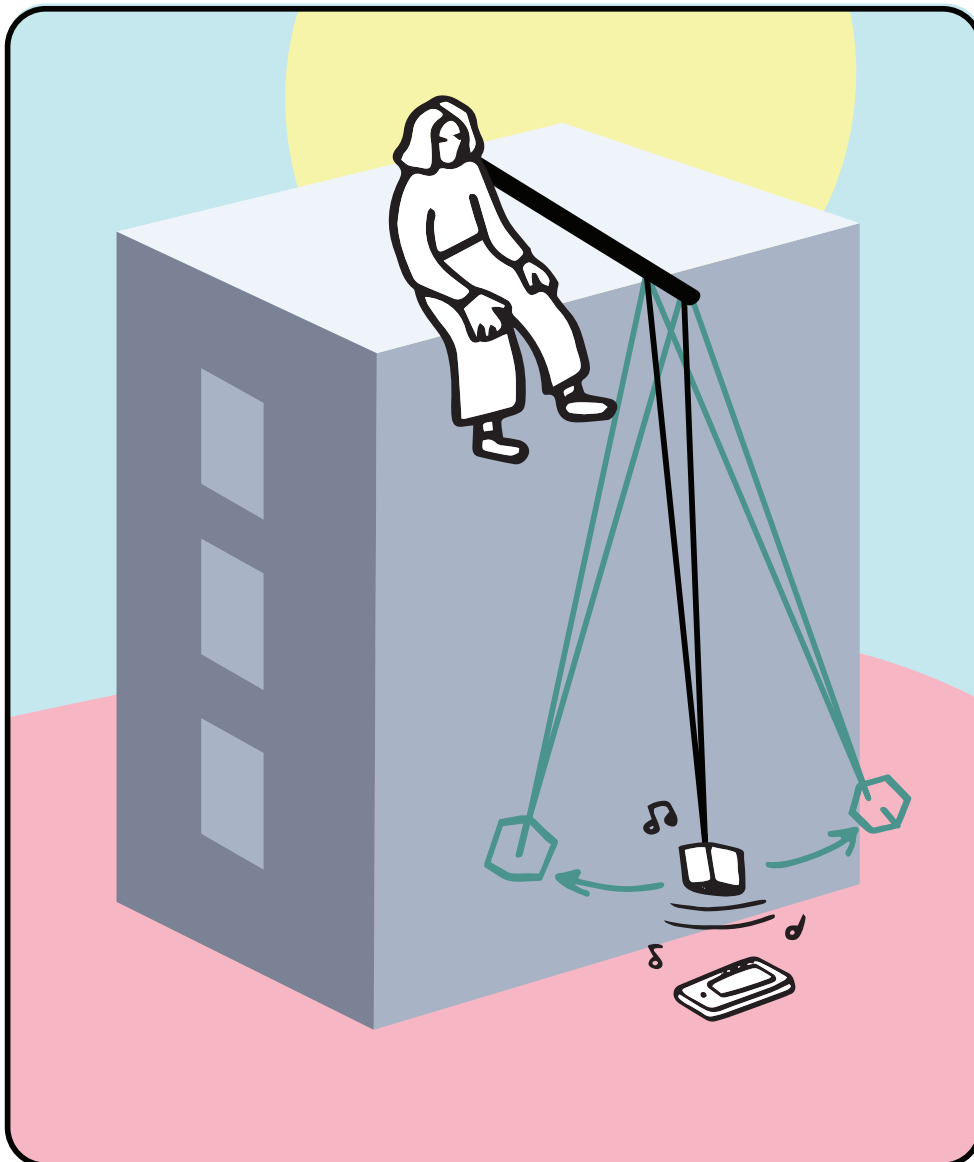


1 bluetooth speaker

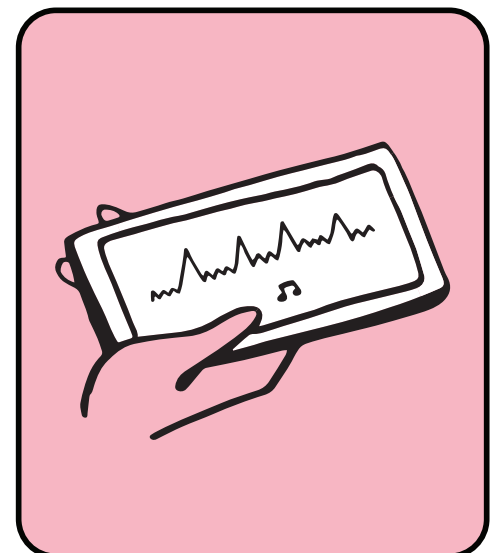


Sensor: **microphone**

1 smartphone



Make a giant pendulum the size of the building. Attach the speaker to the pendulum, and send a constant sound. Position the smartphone vertically, and use the variation in the amplitude of the recorded sound to determine the period.



T = pendulum period,
g = 9.8 ms⁻²

The pendulum must not rotate in all directions, it must only swing.

This project was imagined by Frédéric Bouquet (Paris-Saclay University) and Giovanni Organtini (Sapienza Università di Roma, Italy).

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Videos, photos, gifs: Amel Kolli

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Anna Khazina

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