

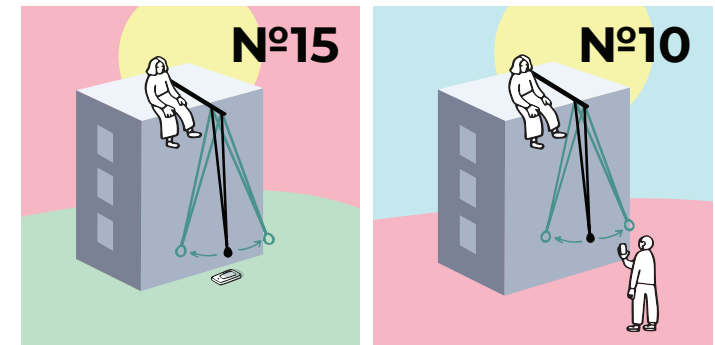
This project was imagined by Frédéric Bouquet (Paris-Saclay University) and Giovanni Organtini (Sapienza Università di Roma, Italy).

Physics: Frédéric Bouquet, Giovanni Organtini, Julien Bobroff

Videos, photos, gifs: Amel Kolli

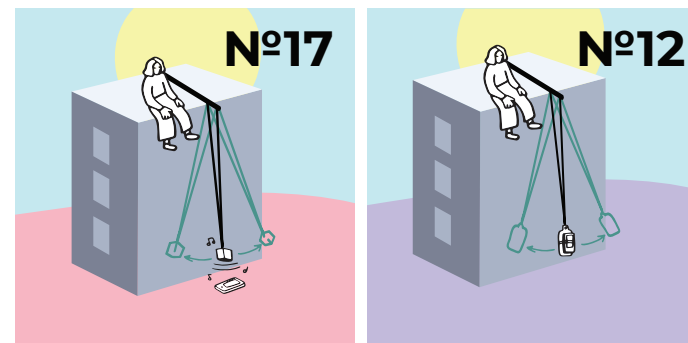
Graphic design and illustrations:
Anna Khazina

This project is a production of «Physics Reimagined» from Paris-Saclay University and CNRS. It benefited from the support of the IDEX Paris-Saclay and of the «Physique Autrement» Chair, held by the Paris-Sud Foundation and supported by the Air Liquide Group.



Challenge **GIANT PENDULUM**

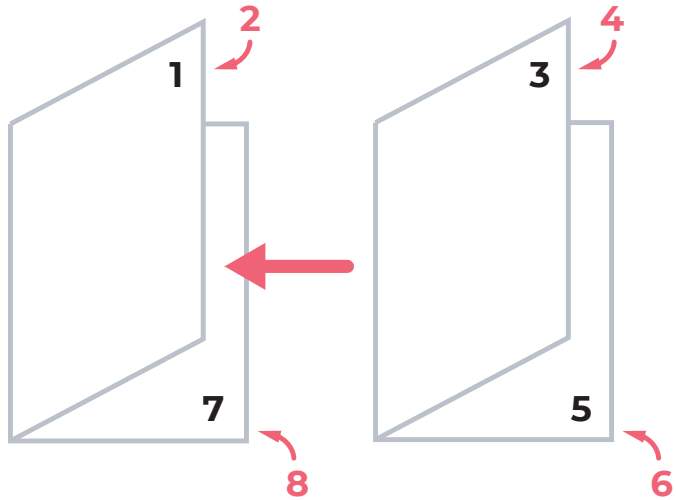
Get inspired by Galileo and measure the height of a building... using a smartphone!



Discover The Smartphone Physics Challenge at [VULGARISATION.FR](https://vulgarisation.fr)

«Physics Reimagined» team (Paris-Saclay University)

To assemble the booklet:



Print on two A4 sheets using both sides (select short-edge binding), then assemble the booklet by folding the sheets in two.

To do measurements with your smartphone:

Install Phyphox app on your phone. This app is developed by Aachen University, it's free and open-source, translated in English and available for Android and iOS. Phyphox allows to conduct measurements using your smartphone built-in sensors.



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

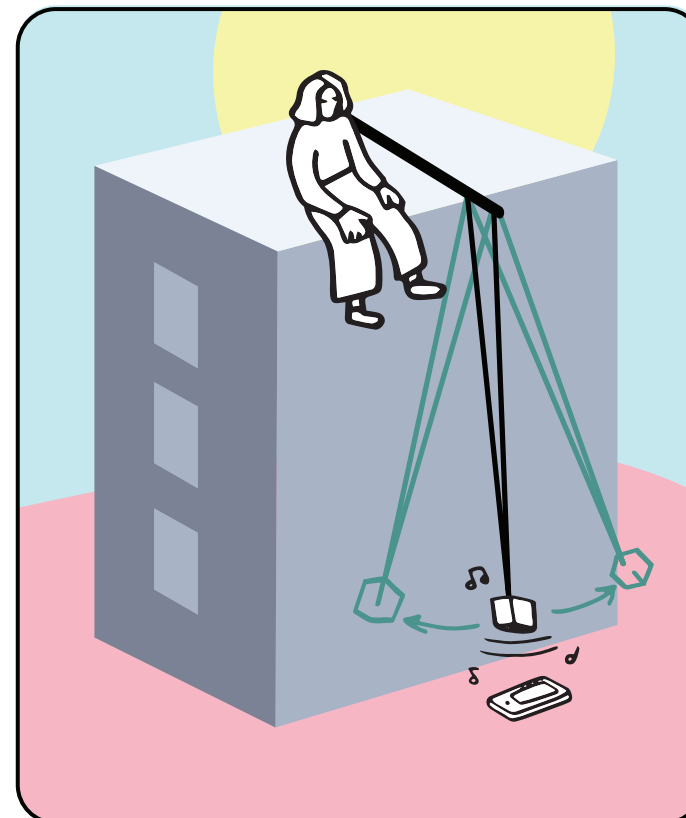


1 bluetooth speaker



1 smartphone

Sensor: microphone



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

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



Precision: high



Difficulty: intermediate

Nº15. Giant Pendulum & Light

Formula

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



1 long rope

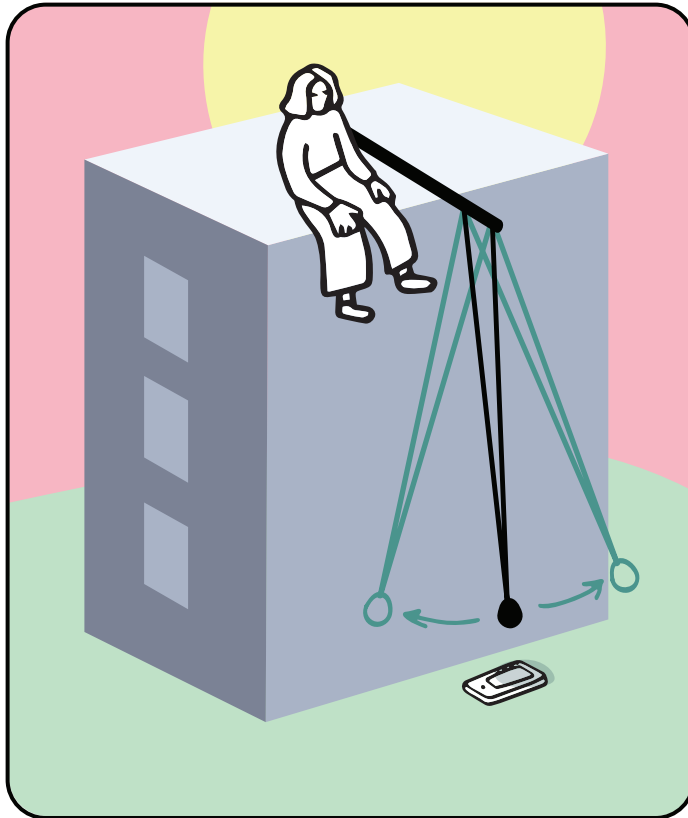


1 mass

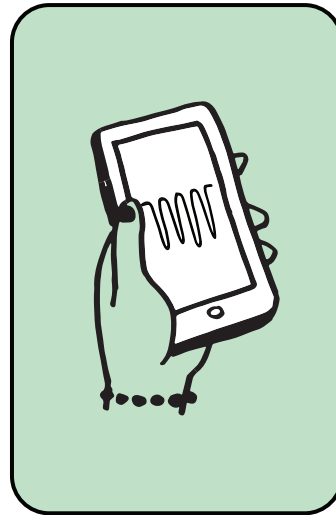


1 smartphone

Sensor:
light sensor



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: maximum



Difficulty: intermediate

Nº10. Giant Pendulum Timed

Formula

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



1 long rope

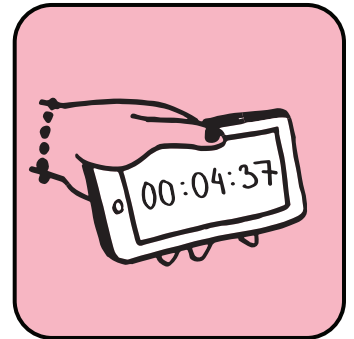
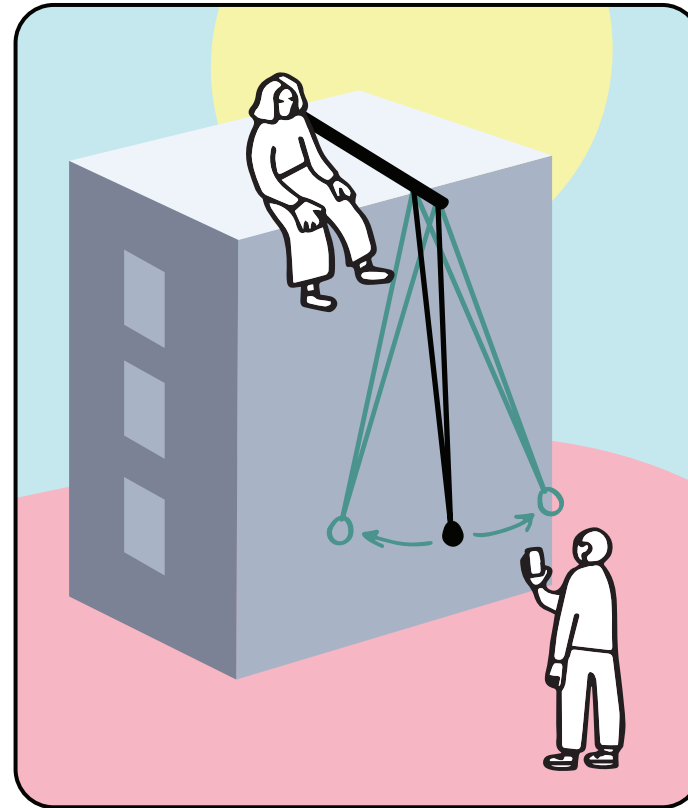


1 mass



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 ms⁻²

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

