Welcome to IOP Ireland Physics Hub

We will be starting at 19:00

Please turn off your webcam and microphone
This will help reduce background sound and help with bandwidth issues

IOP Institute of Physics

ZOOM controls

If you have questions please post them in the Chatbox

Chat

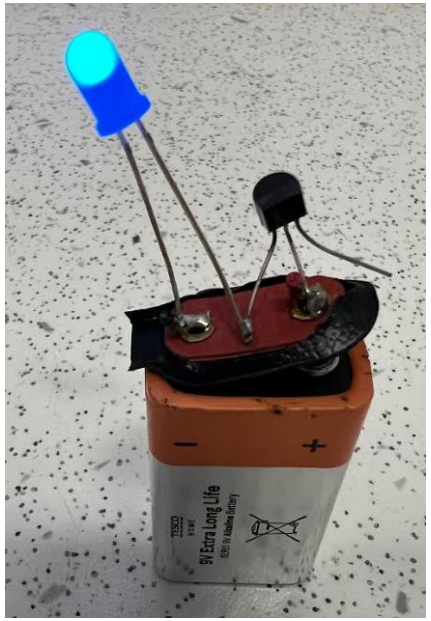
Introductions

David Keenahan	IOP Physics Coach
Paul Nugent	IOP Physics Coach

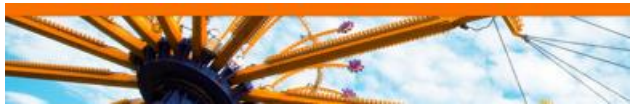
IOP Institute of Physics

Hub-96 Circuits

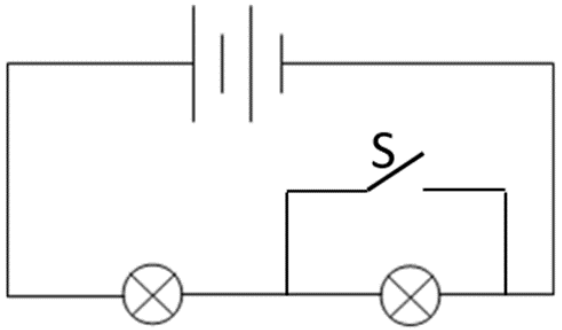
Máire Duffy's FET electroscope

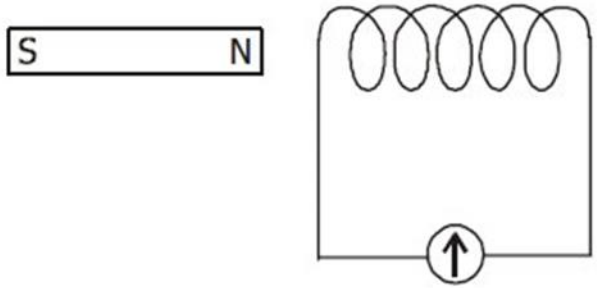


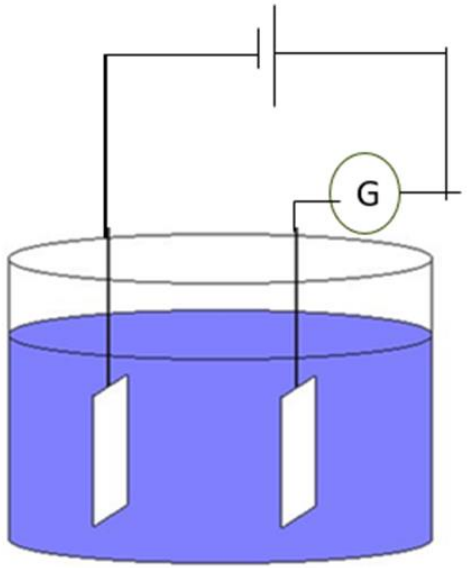
Rory'Geoghegan's recommendation
https://www.physicsclassroom.com/class/circuits

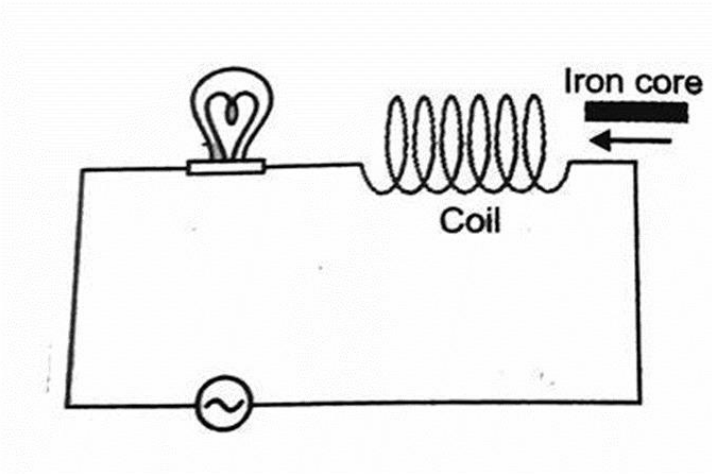


Alan Casey showed a video he made about the Triboelectric effect. available at:
https://padlet.com/mathsmrcasey/from-static-to-light-let-s-illuminate-the-charge-ztfzmqkd2xorna0p









Hub-97

We meet to share ideas and support each other in the teaching of Physics

Theme

Make-it-yourself Physics

upcoming events

IOP Institute of Physics

Overview Some of my favourite tools and resources

Institute of Physics

Homemade demonstrations

Homemade demonstrations can have great impact

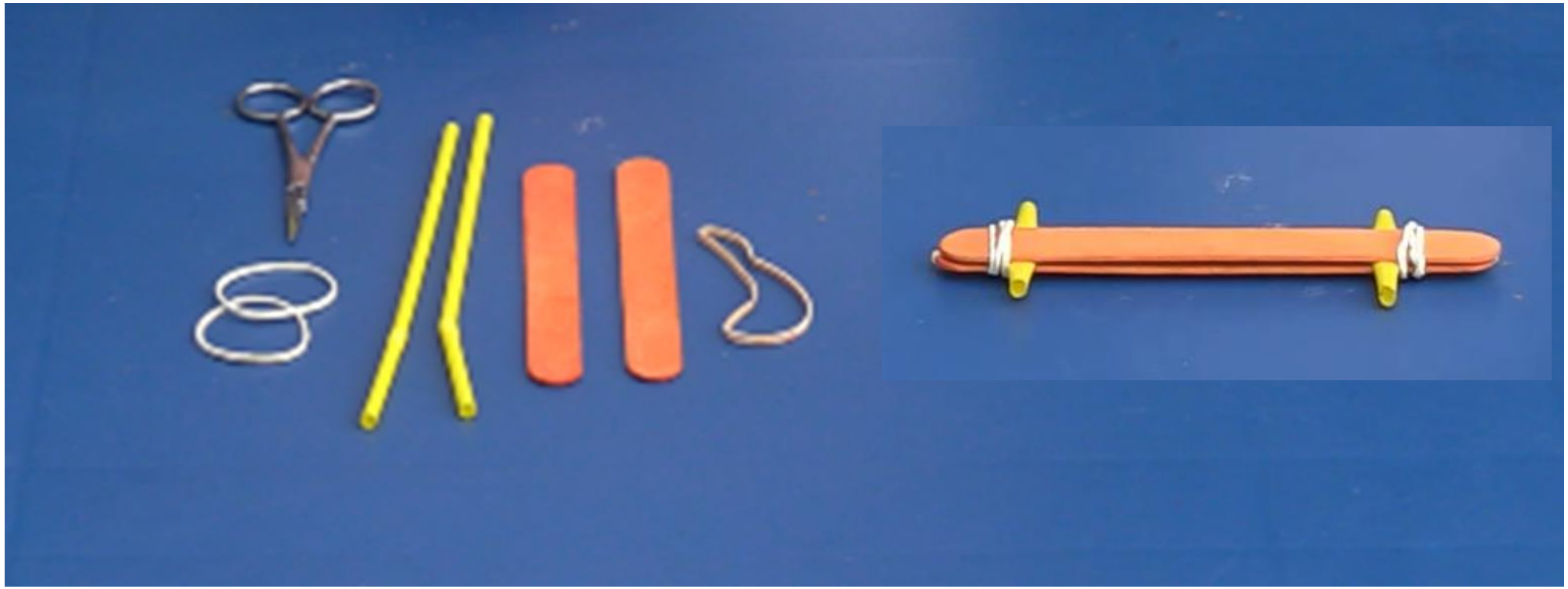
How might students become part of the demonstration?

Can they experience the concepts in a tactile way?

What value do demonstrations add to a lesson?

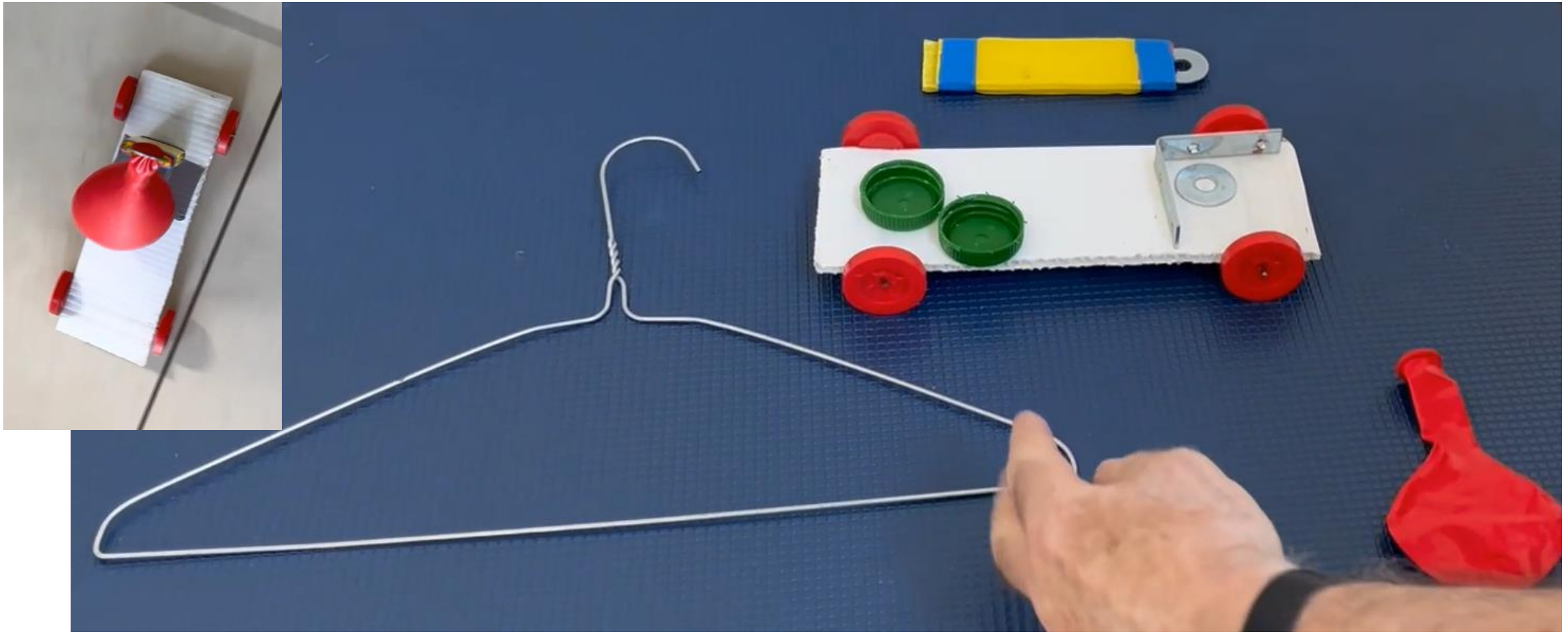
What suggestions would you make?

Sound sandwich



Place your lips on the “mouth organ” and blow air through the gap between the lollipop sticks.
The brown rubber band will vibrate in the airstream giving rise to a loud sound.

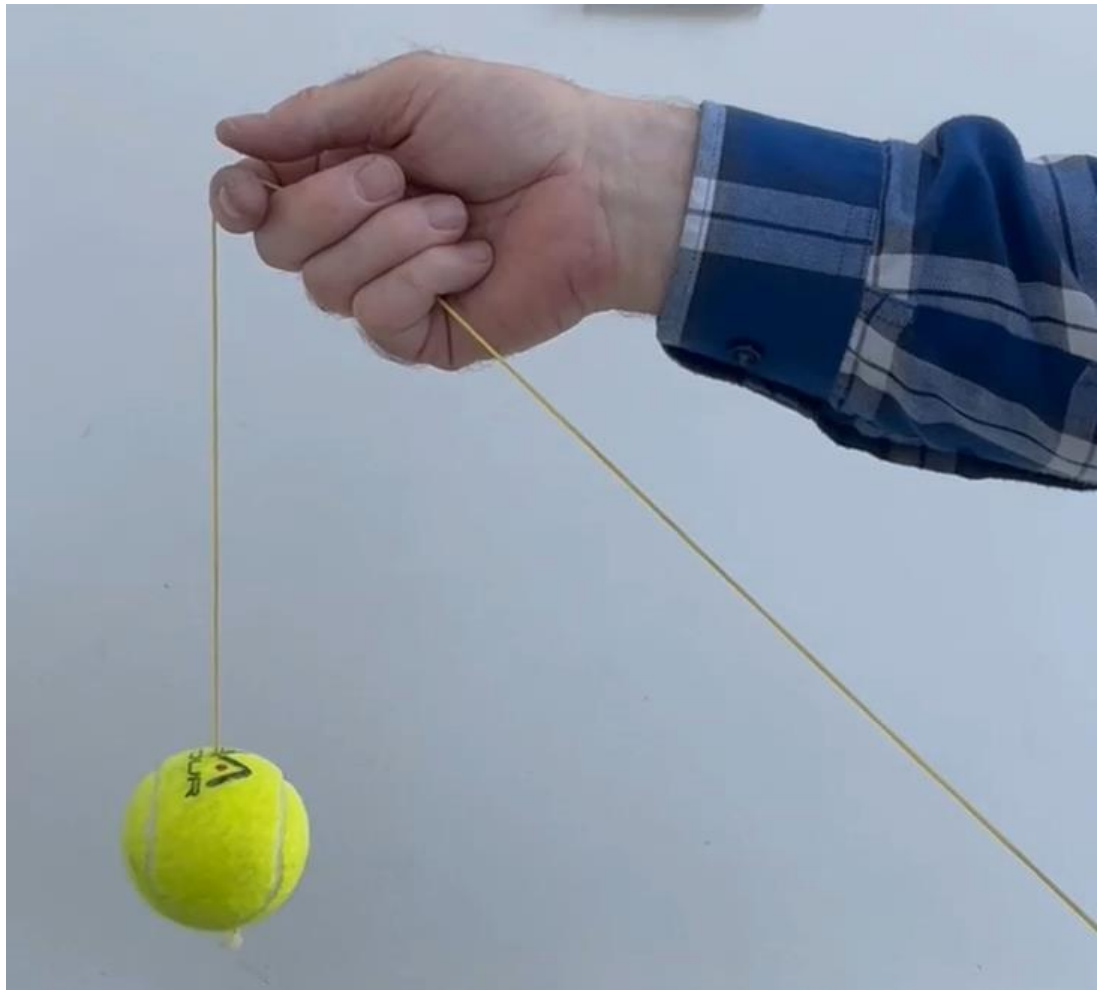
Balloon powered car



As air escapes from the balloon, the car is propelled in the opposite direction (by Newton's 3rd law)

IOP Institute of Physics

Circular motion with a tennis ball



When the tennis ball is swung in a circle, the tension in the string is the centripetal force.

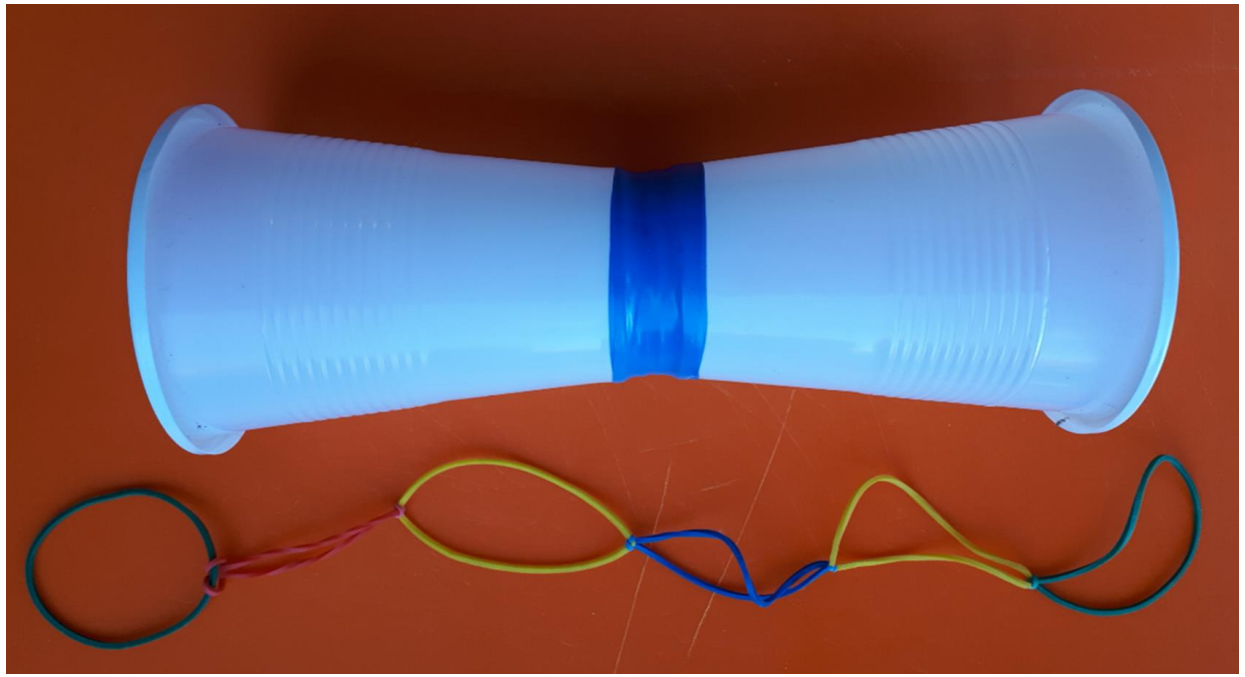
The person can feel a similar tension in their arm.

It is easy to experience how the rate of rotation and the increase in radius length both cause the tension to increase.

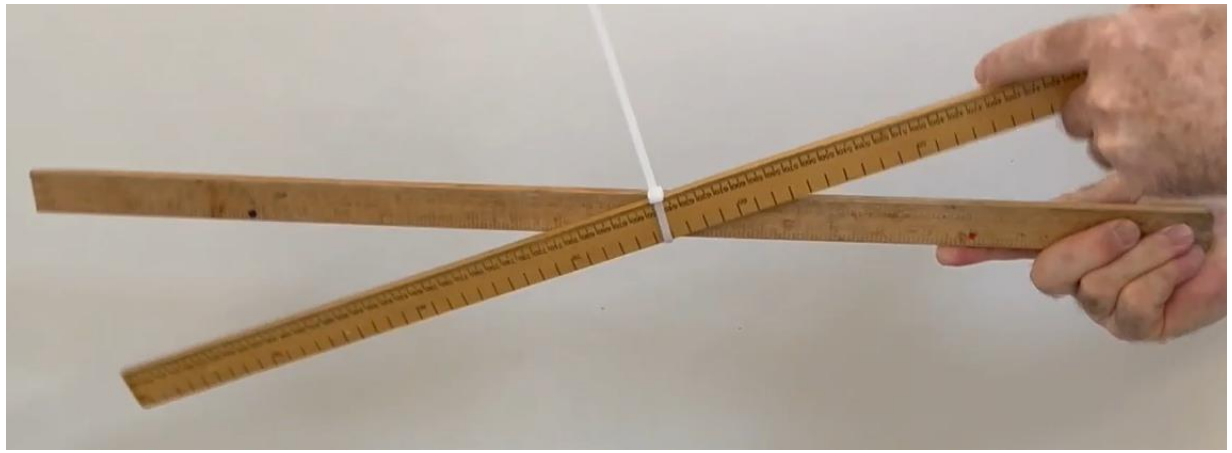
$$F = \frac{mv^2}{r}$$

Loop-the-loop energy conversions demontration

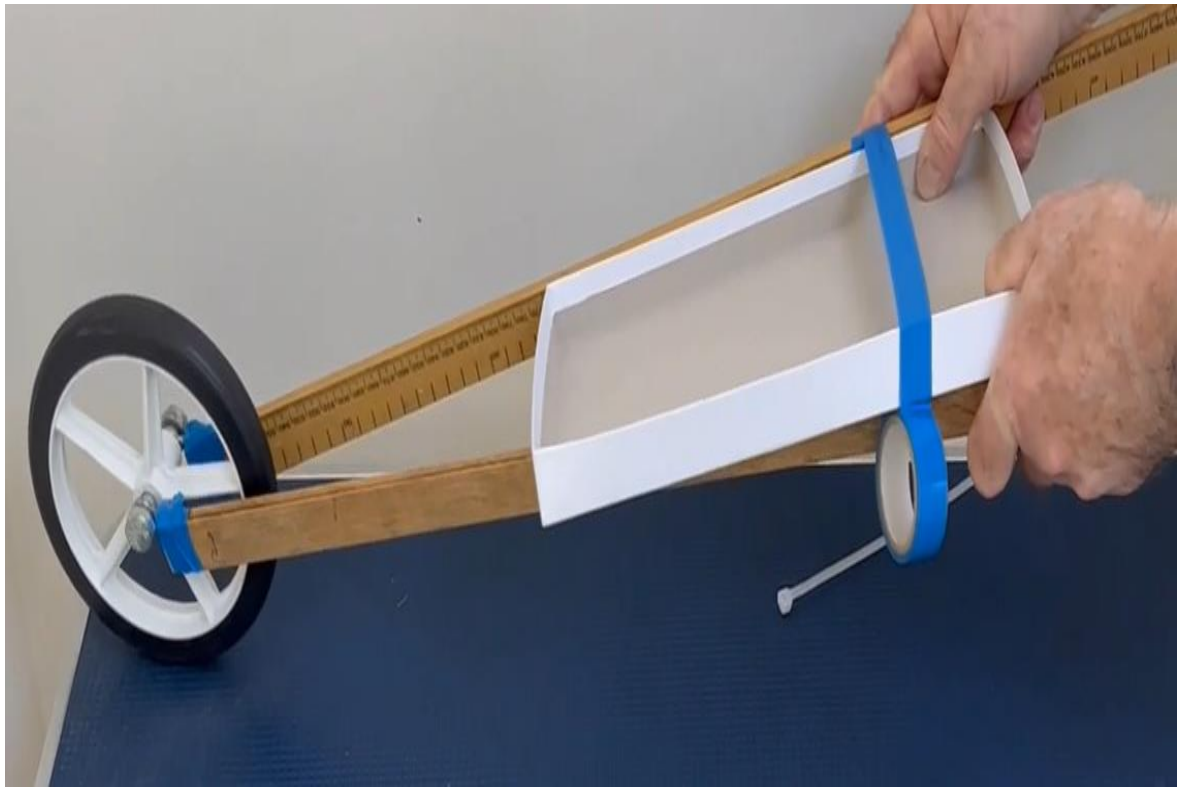
Wrap the elastic once around the cups. When work is done to stretch the elastic, energy is stored as P.E. in the rubber. Release your grip on the cups to allow them travel with K.E. imparted by the elastic. Some of the KE is translational, taking the cups away from the person and some of the KE is rotational which causes the cups to spin backwards, catching the air and experiencing an uplift (Magnus effect).



Levers and fulcrum with metersticks



Scissors and tweezers



Wheelbarrow

IOP Institute of Physics

Pressure Thumbtack cushion

Pressure $P = \frac{F}{A}$

So, when A is small as in the point of a thumbtack, the pressure is large.
Having 100 thumbtacks close together increases the area x100
and reduces the pressure.

IOP Institute of Physics

Hydraulic action

Pumping oil between 2 cylinders of different diameter,
provides a mechanical advantage that enables us lift tonnes.

Explore momentum and energy with clackers

You will need, 2 golf balls, Sugru, and fishing line.
Allow 24 hours for the mouldable glue (sugru) to set.

At each collision observers witness that momentum is conserved.
Some energy is dissipated as sound, so energy needs to be given by lifting your hand upwards (giving back energy to the system) allowing collisions to continue.

IOP Institute of Physics

Buoyancy and Cartesian diver

Squeezy droppers will only float vertically in tap-water if some weight is attached near the open end.

Adjust the number of hexagonal nuts until the dropper floats with only 1 cm visible above the water surface.

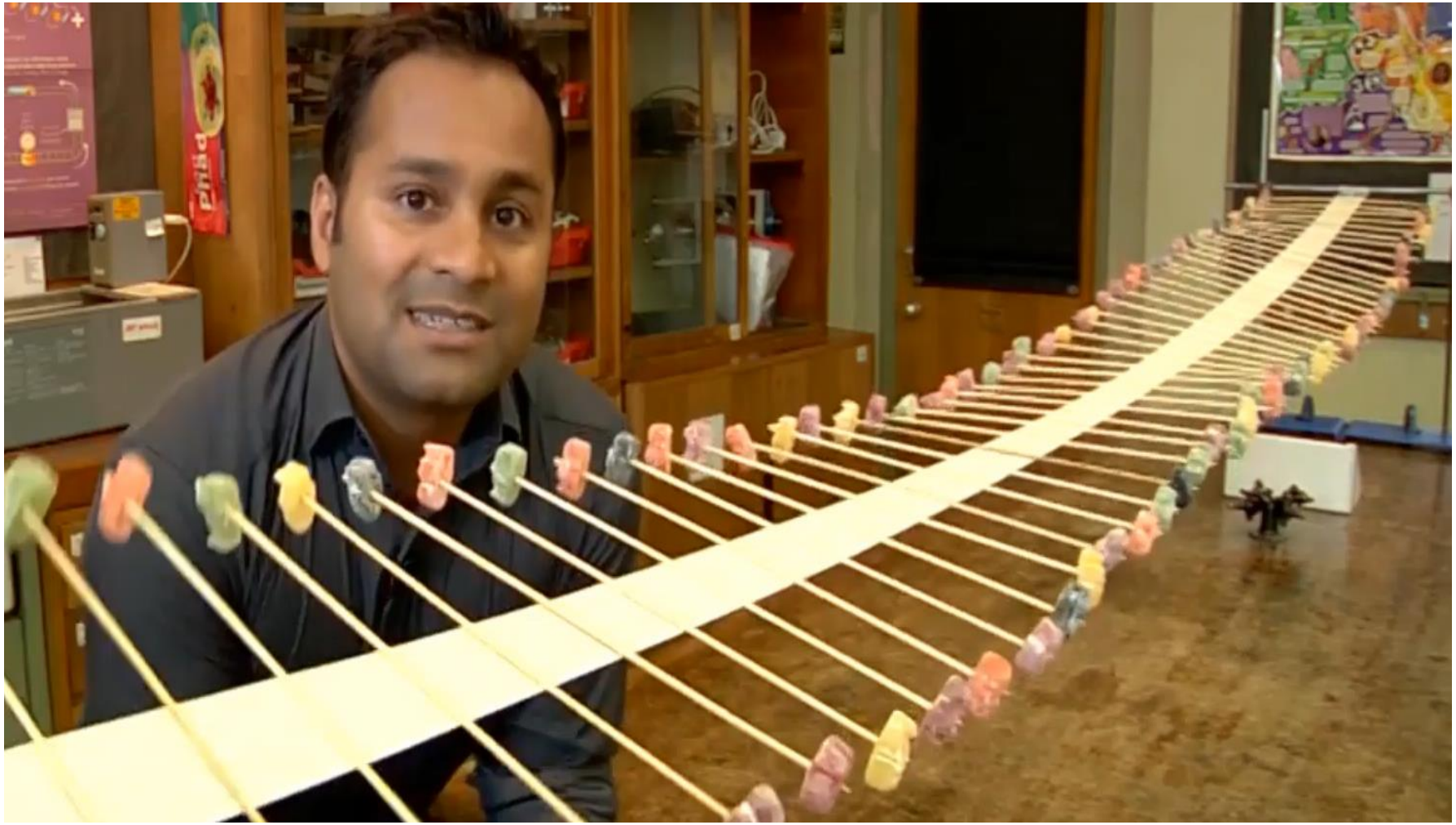
Seal the litre plastic bottle with the lid.

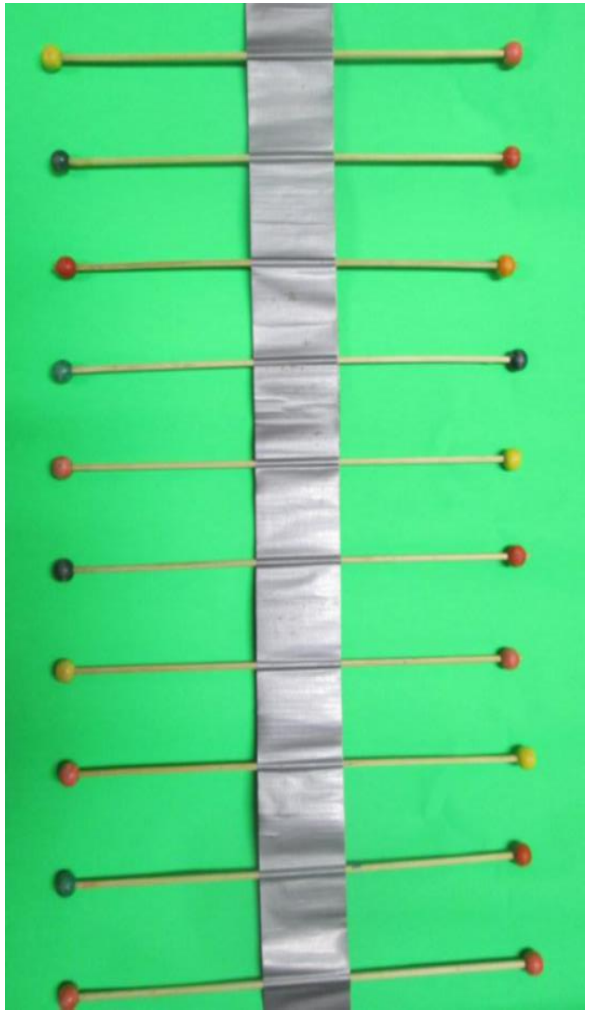
Squeeze the bottle tightly to force the “Cartesian Diver” to sink.

Explanation: the extra pressure forces the water level higher up within the dropper, making it less buoyant.

IOP Institute of Physics

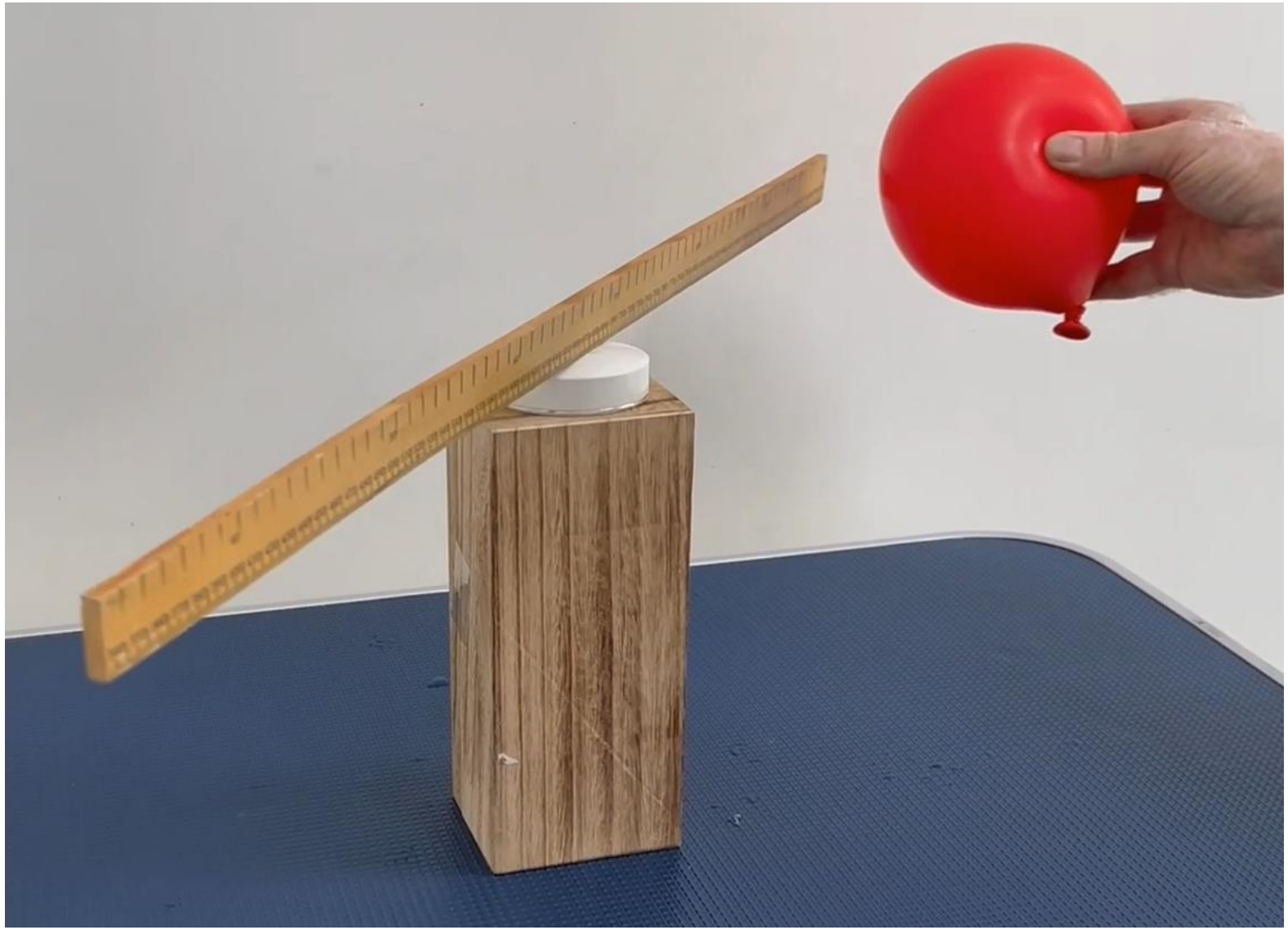
Kebab wave machine





IOP Institute of Physics

Action at a distance electrostaics



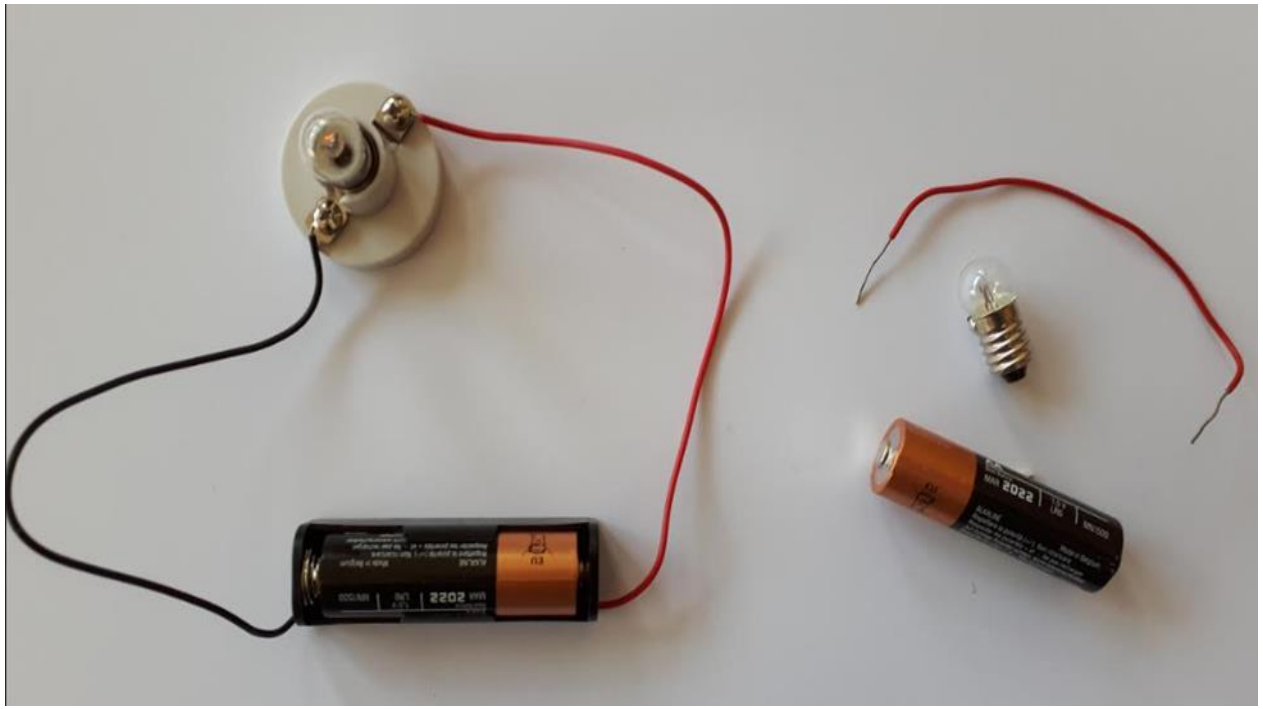
Charge the balloon by friction, and bring it close to (but not touching) the meterstick.

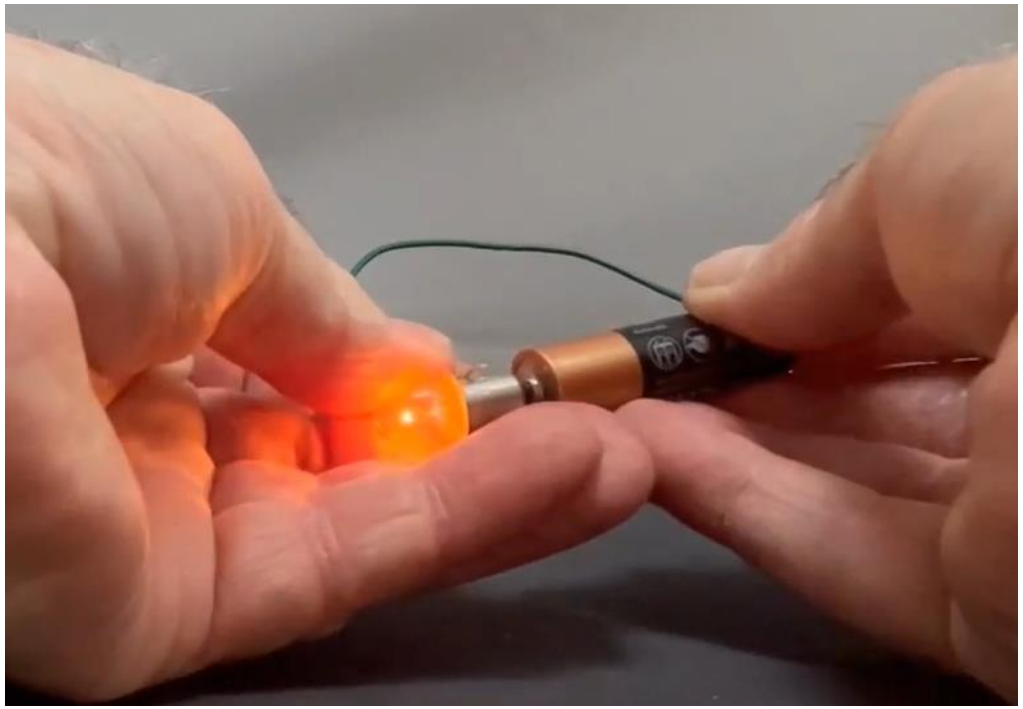
The meterstick will be attracted to the ballon and rotate to follow the balloon.

Explanation: while the meterstick remains uncharged throughout, there is a redistribution of the positives and negatives on the wood, so that whichever is opposite in nature to the charge on the ballon accumulates on the side of the stick nearest the balloon.

IOP Institute of Physics

Light a bulb with only one wire



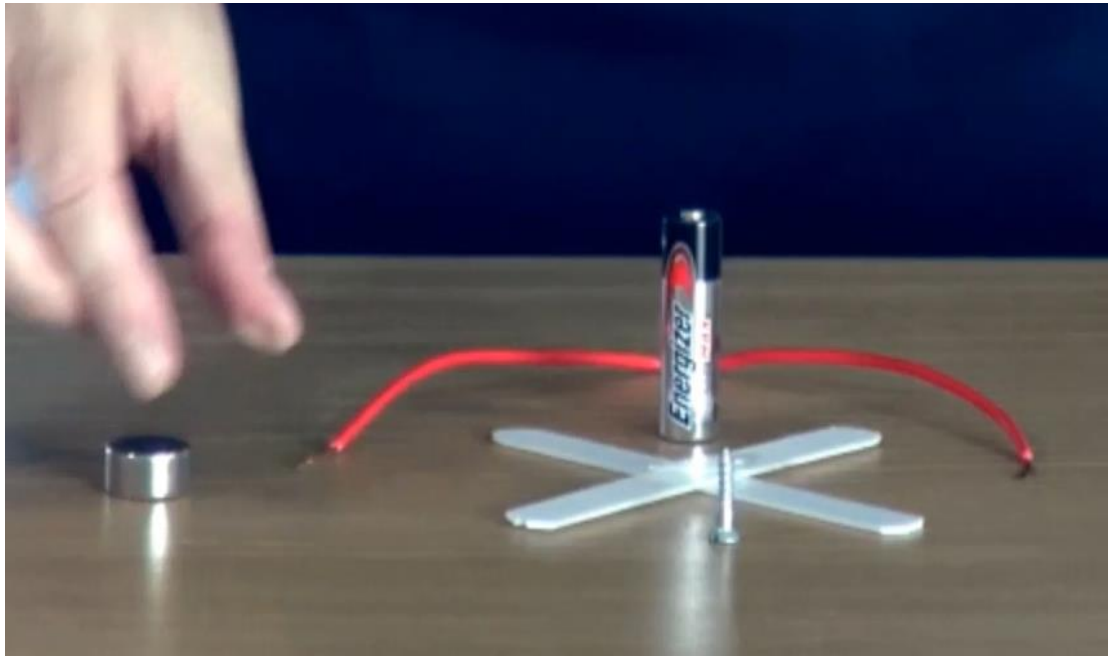


Electric current will only flow around a closed loop. If only one wire is available, then place the tip of the bulb against the tip of the battery and use the wire to join the base of the battery to the metallic cylinder part of the bulb.

MIT graduates cannot power a light bulb with a battery
https://www.youtube.com/watch?v=aIhk9eKOLzQ&t=8s

IOP Institute of Physics

A simple electric motor



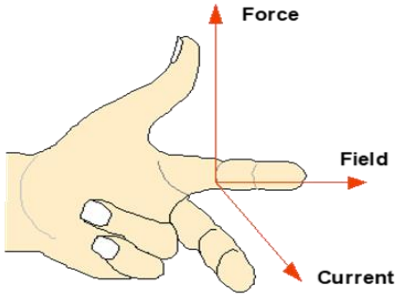
With one end of the wire touching the negative pole of the battery, bring the other end of the wire in contact with the neodymium magnet and current will flow through the closed loop, inducing a magnetic field. There is already a permanent magnetic field surrounding the magnet. The interaction of the 2 fields causes the screw to rotate. The propeller aids visibility.

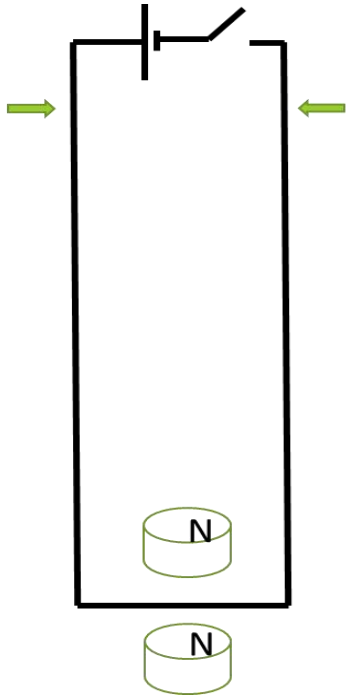
Acknowledgements Paul Nugent and http://www.scienceonstage.ie/

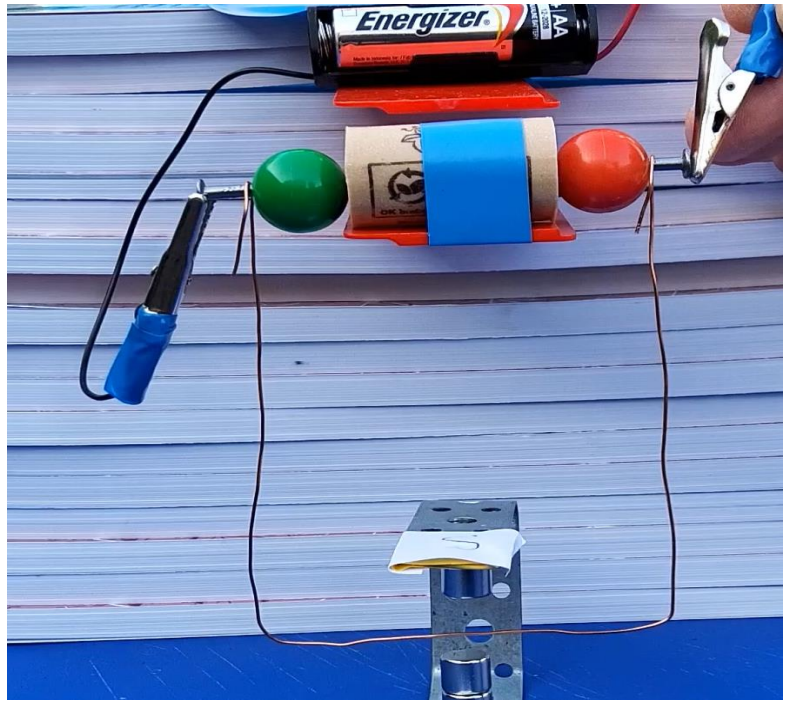
IOP Institute of Physics

F = Bil illustrated with a Trapeze made of bare copper wire

F = Bil illustrated with a Trapeze made of bare copper wire





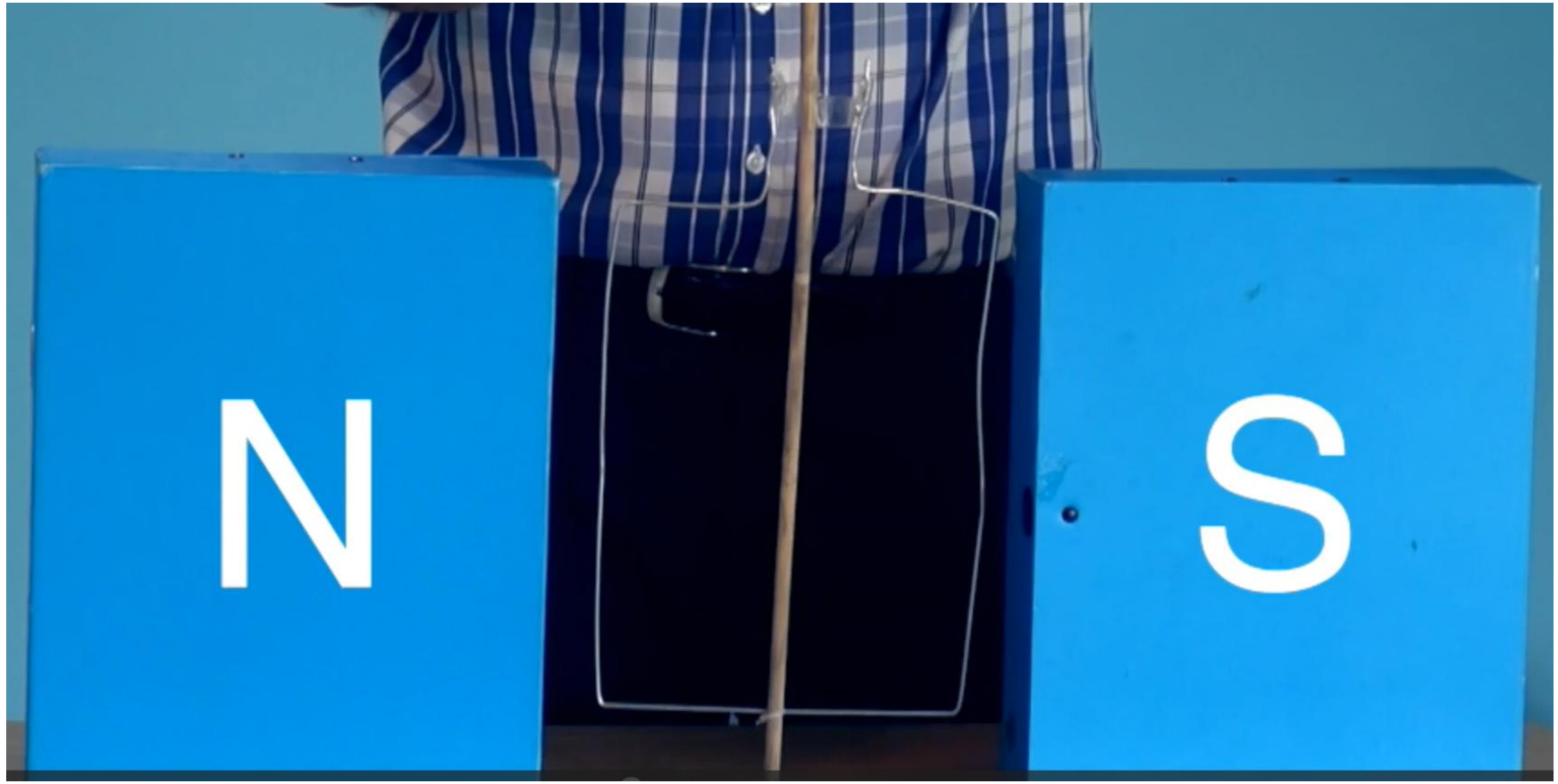


When the switch is closed, charge flows and the resulting current in the copper wire sets up a magnetic field surrounding the wire.
This new field interacts with the permanent field between the magnets causing the wire to be kicked out of the field.
Gravity causes the wire to fall back only to be kicked out again and again

IOP Institute of Physics

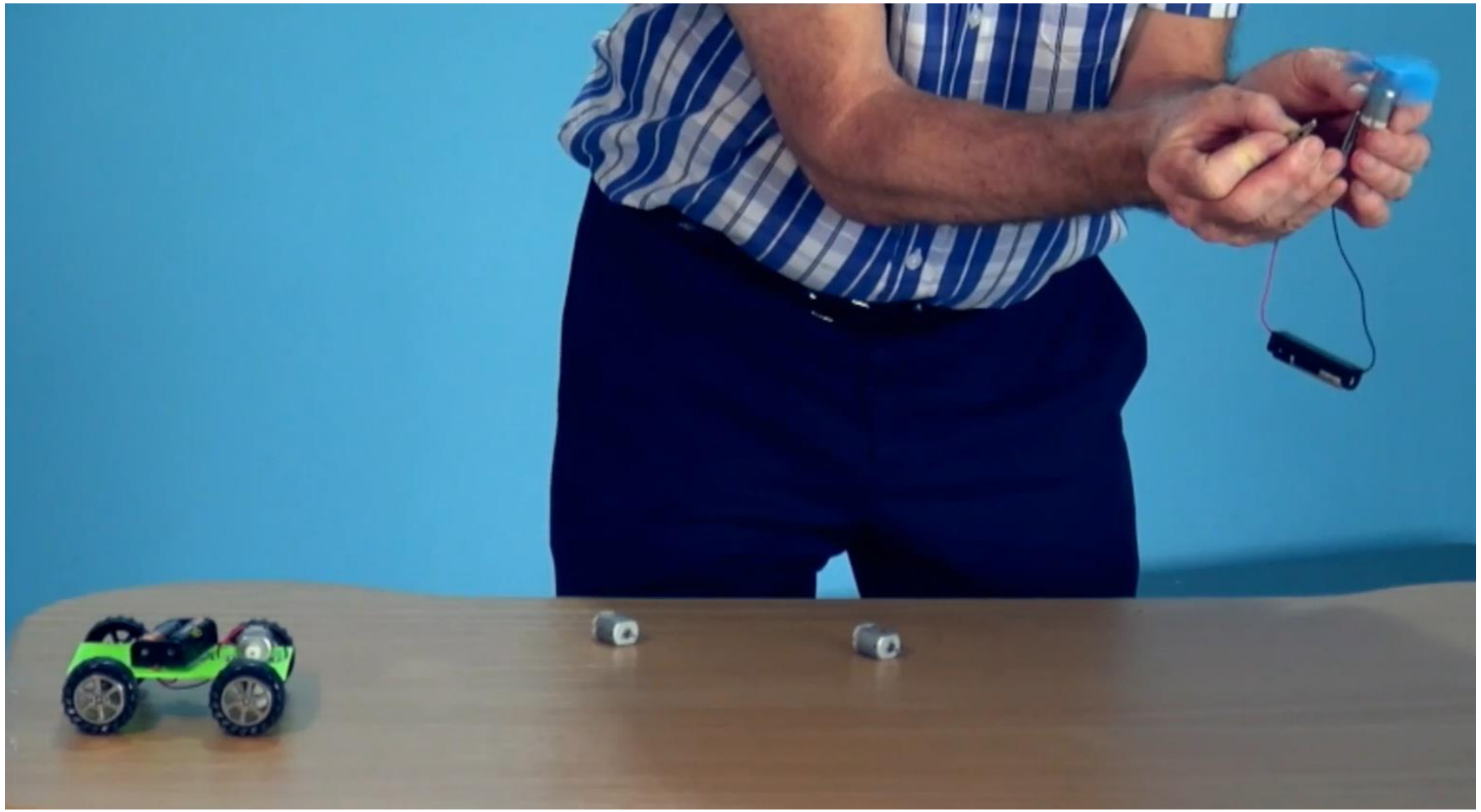
Model of an electric motor

Fleming’s left-hand rule and F = Bil are at work when the coil rotates in an electric motor



Large visible props help when explaining Fleming’s left-hand rule.

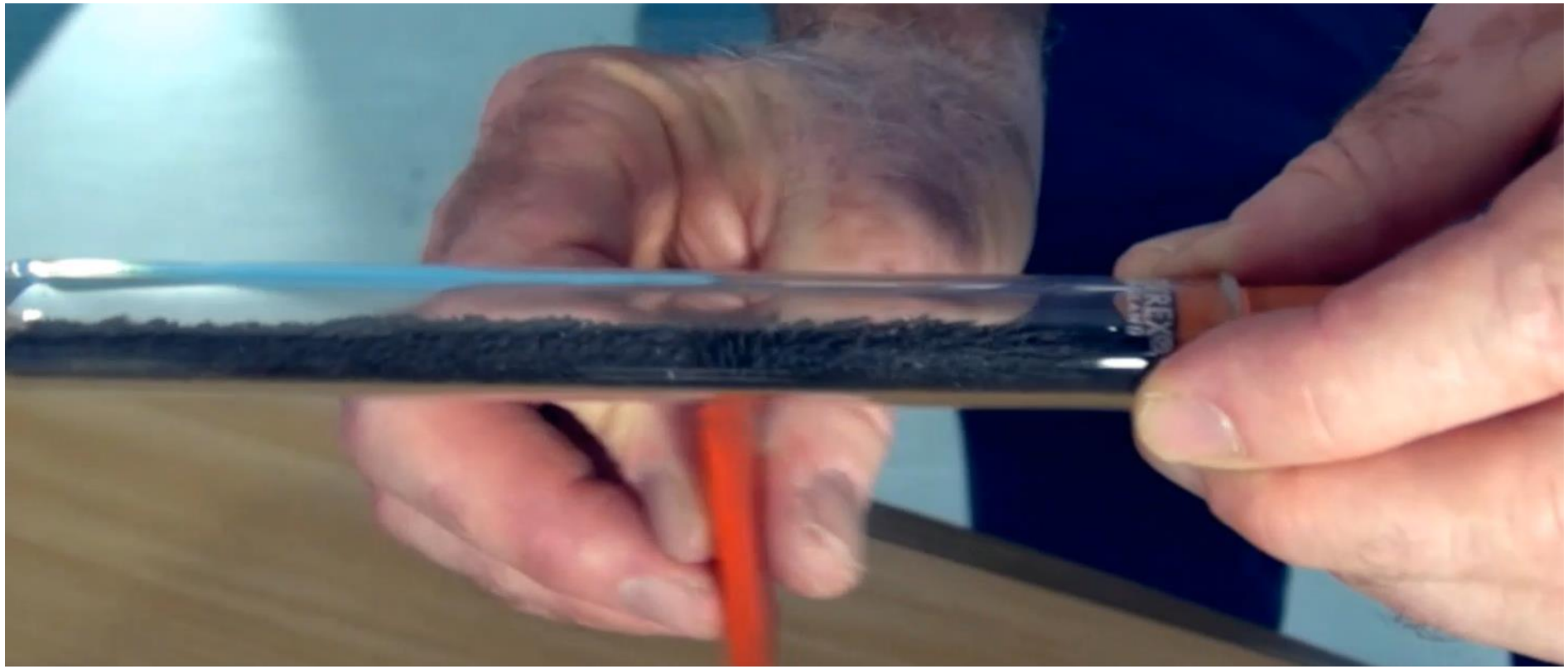
Small electric motors



These tiny electric motors are inexpensive and give students an opportunity to see that electricity gives us more than light and heat.

IOP Institute of Physics

Test tube of iron filings



One can magnetize an iron nail and demagnetize it but using a test tube of iron filings gives a far greater visual idea of what is happening. Observe if it affects a compass needle. Then shake the test tube and the iron filings lose their magnetism, which the compass can confirm.

IOP Institute of Physics

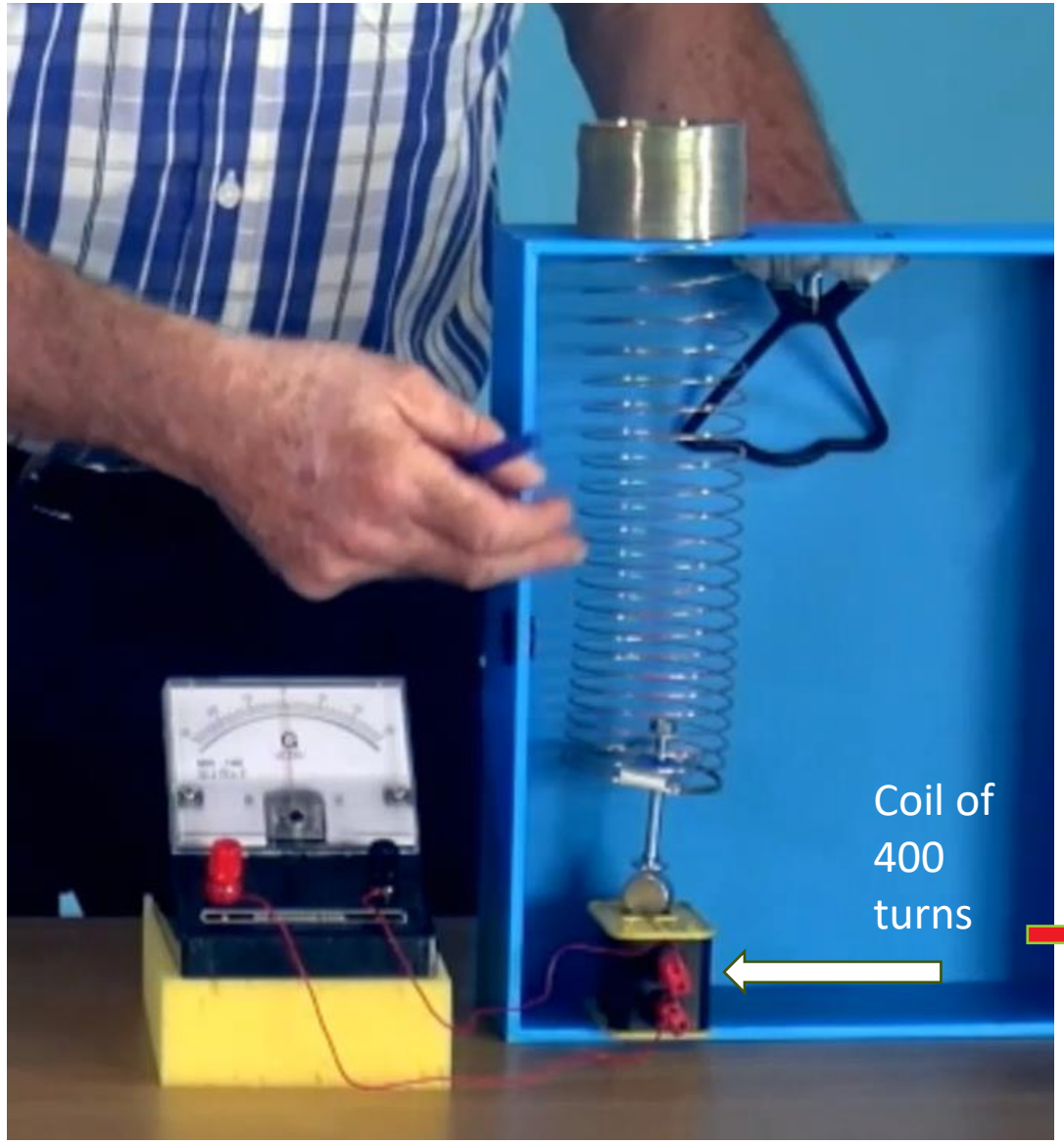
Make a model of an anemometer

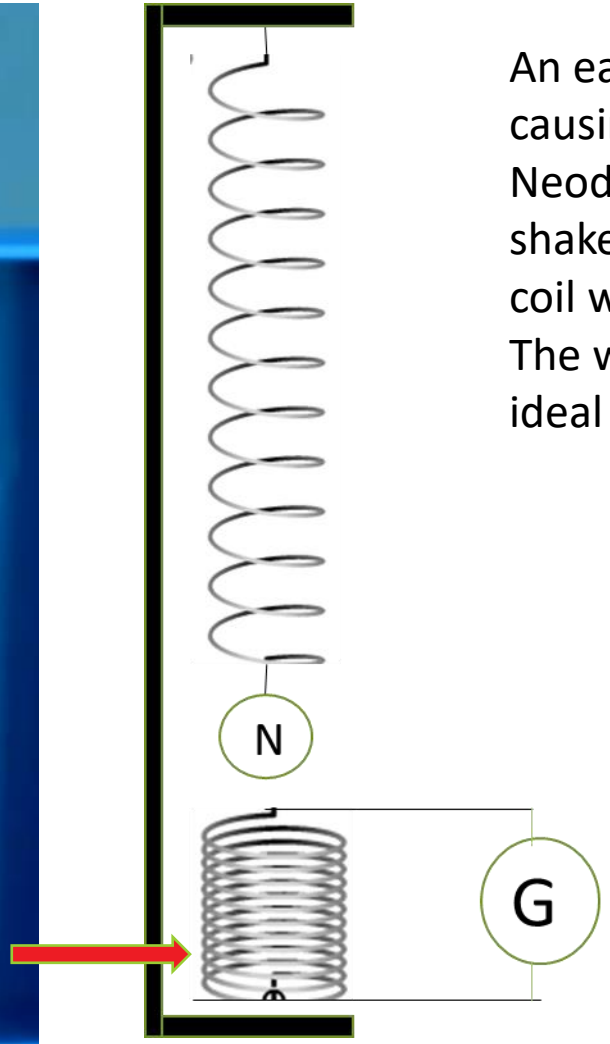
Anemometers measure wind speed.

The energy from wind may be used to generate electricity.

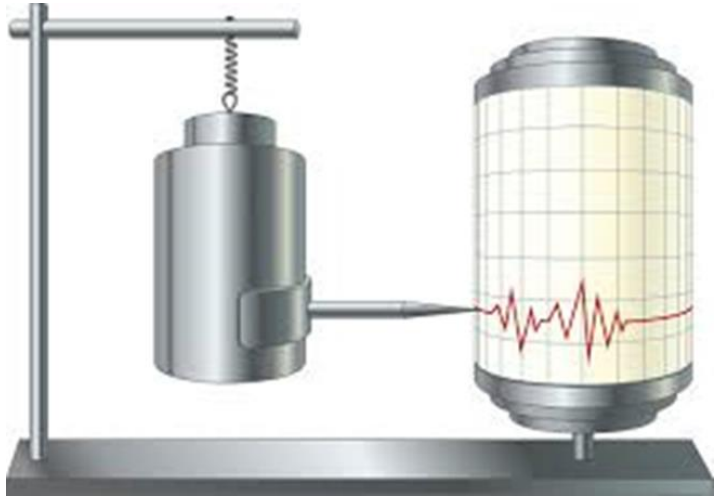
This demonstration addresses both ideas.

Slinky seismometer

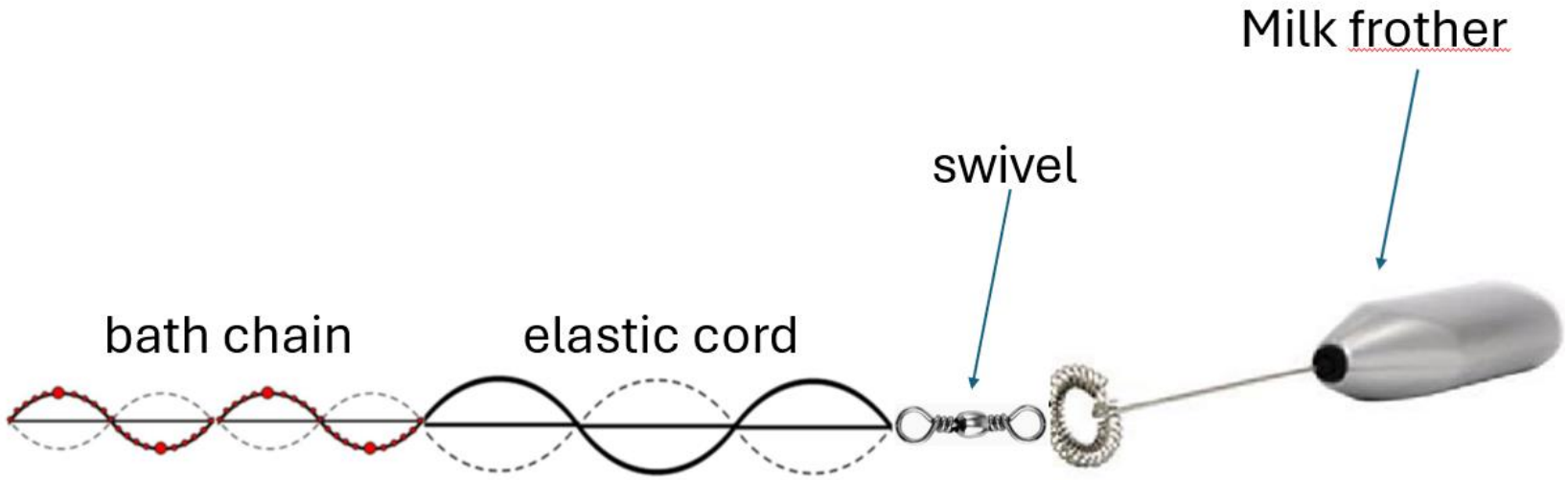




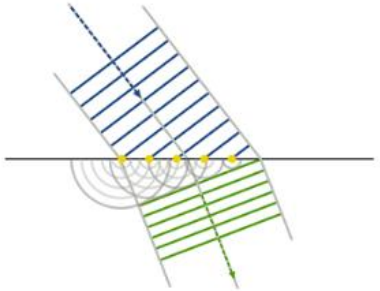
An earthquake would shake a building causing the slinky to shake and the Neodymium magnet (N) hanging from it shakes, thereby inducing a current in the coil which the Galvanometer (G) detects. The weak elastic constant k of a slinky is ideal for this model.



Standing waves generated by a milk frother



$$v = f\lambda$$



Use tiny cable ties to connect the swivel to the frother and to connect the elastic cord to the bath chain.
Tie the other end of the elastic cord to the swivel.

Switch on the frother, and hold the bath plug by hand. Standing waves form easily at a light tension.

Observe the pattern of nodes. Can you tell anything about the speed of the waves?

IOP Institute of Physics

Upcoming events

ISTA Junior Science Quiz

Irish Science Teachers' Association

Eol Oidí na hÉireann

Registration is now open for the Dublin Branch Junior Science Quiz
which takes place on Wednesday April 24th
at 2:30 pm
in Belvedere College.
Registration via the following form:
https://docs.google.com/forms/d/e/1FAIpQLSdnX-KHYruPQZG3iXJ_ueuw2n96YbRnr9Nf1vbpDSCLYnTupg/viewf

IOP Institute of Physics

The next IOP Physics Hub

Next IOP Physics Hub will be on 18 April

Booking at:
https://www.smartsurvey.co.uk/s/654EWI/
or
https://spark.iop.org/events

IOP Physics Hub
https://spark.iop.org/events
IOP Institute of Physics

Resources including Notes, Weblinks & Presentations
will be emailed to attendees and
will be available at the following link:
IOP Physics Hub padlet

IOP Institute of Physics