

# Hub-95 school physics as preparation for a career in engineering

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

Theme: **Physics is great preparation for a career in engineering**

David Keenahan

IOP Physics Coach

Paul Nugent

IOP Physics Coach

Eamonn Lannoye

Managing Director, Electric Power Research Institute EPRI

Ken Keohane

President, ISTA

Senior Manager, Thermo Fisher Scientific, Cork

upcoming events

# Engineering in Primary schools

**Breaking news !!!**



**NCCA**

An Chomhairle Náisiúnta  
Curraim agus Measúnachta  
National Council for  
Curriculum and Assessment

## **Draft Science, Technology and Engineering Education Specification**

**For Primary Schools**

**Open Consultation, launched on 6 March 2024**

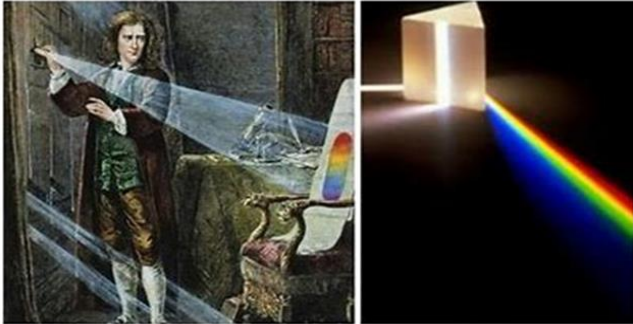
<https://ncca.ie/en/primary/primary-developments/primary-curriculum-review-and-redevelopment/consultation-2024/>

Science has been only a  
component of  
SESE

Social, Environmental &  
Scientific Education  
would evolve to

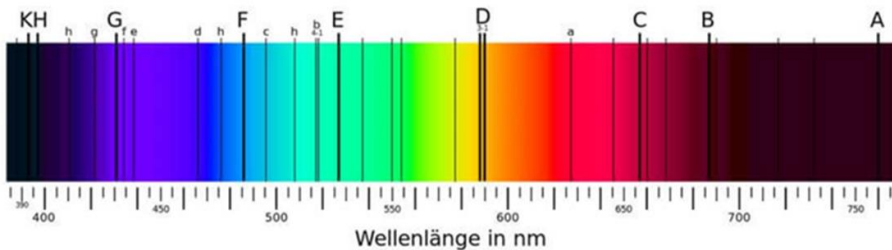
Social and  
Environmental  
Education (SEE);

Science, Technology  
and Engineering  
Education (STE)



Newton in 1666 used a glass prism to produce the same spectrum from sunlight as is seen in a rainbow.

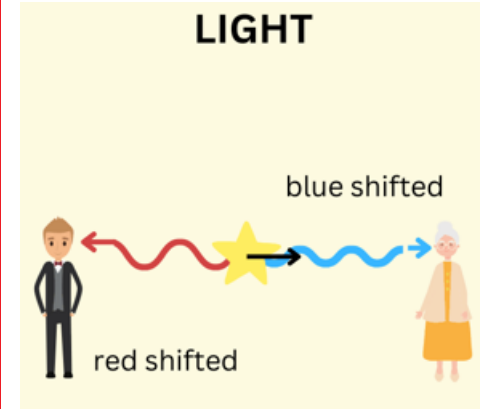
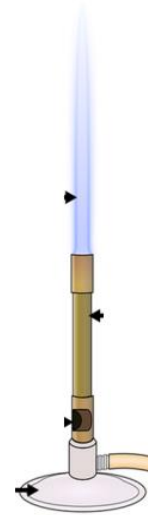
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Fraunhofer in 1814 observed dark lines in the spectrum of sunlight (due to absorption)



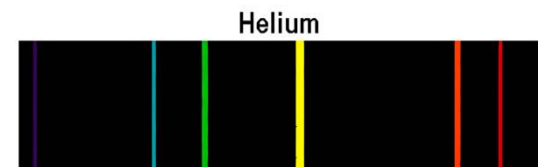
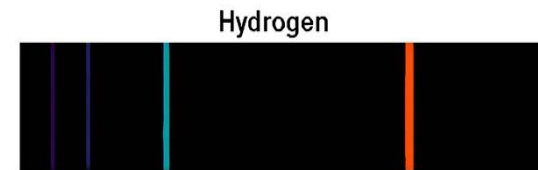
Adjust a spectrometer (video)  
<https://www.youtube.com/watch?v=h4RiczDeLQY>



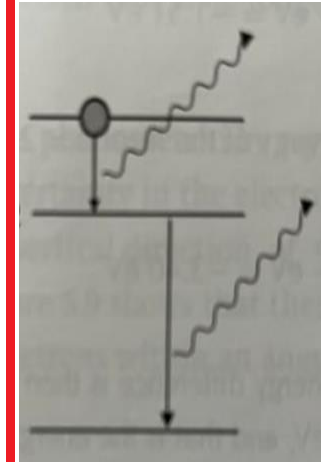
Gustav Kirchhoff Robert Bunsen



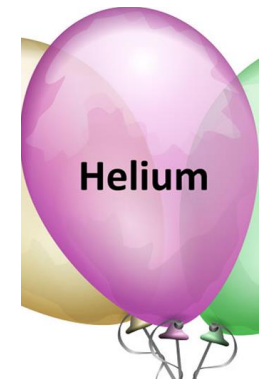
Doppler effect --  
Expanding universe



discovered 2 new elements,  
caesium and rubidium



Bohr atom aligned  
with spectral lines

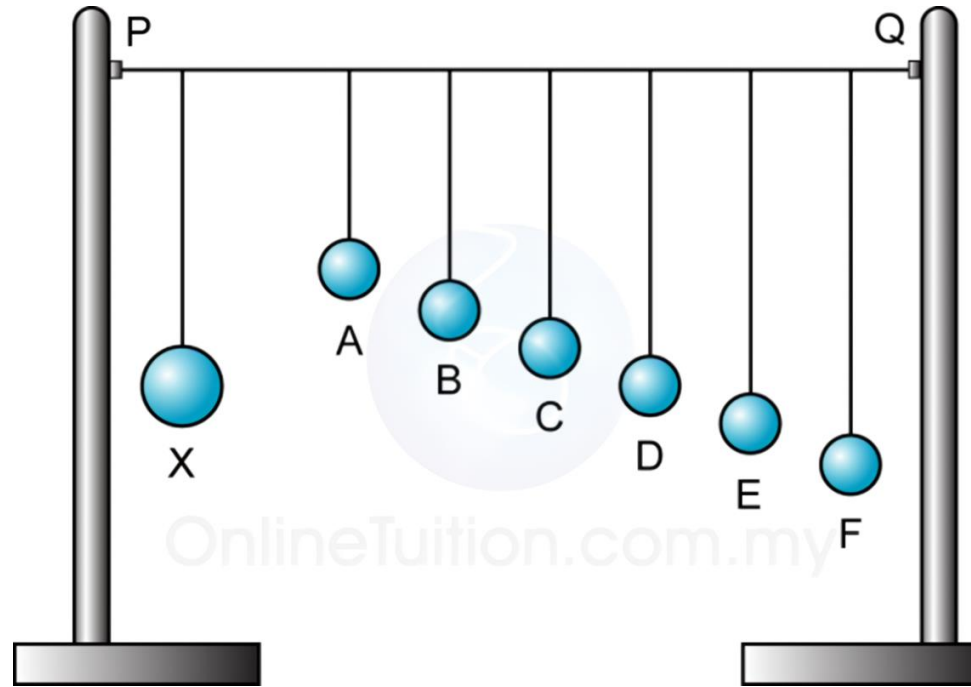


The beauty of spectroscopy is that tiny traces of a substance can be detected.

# overview

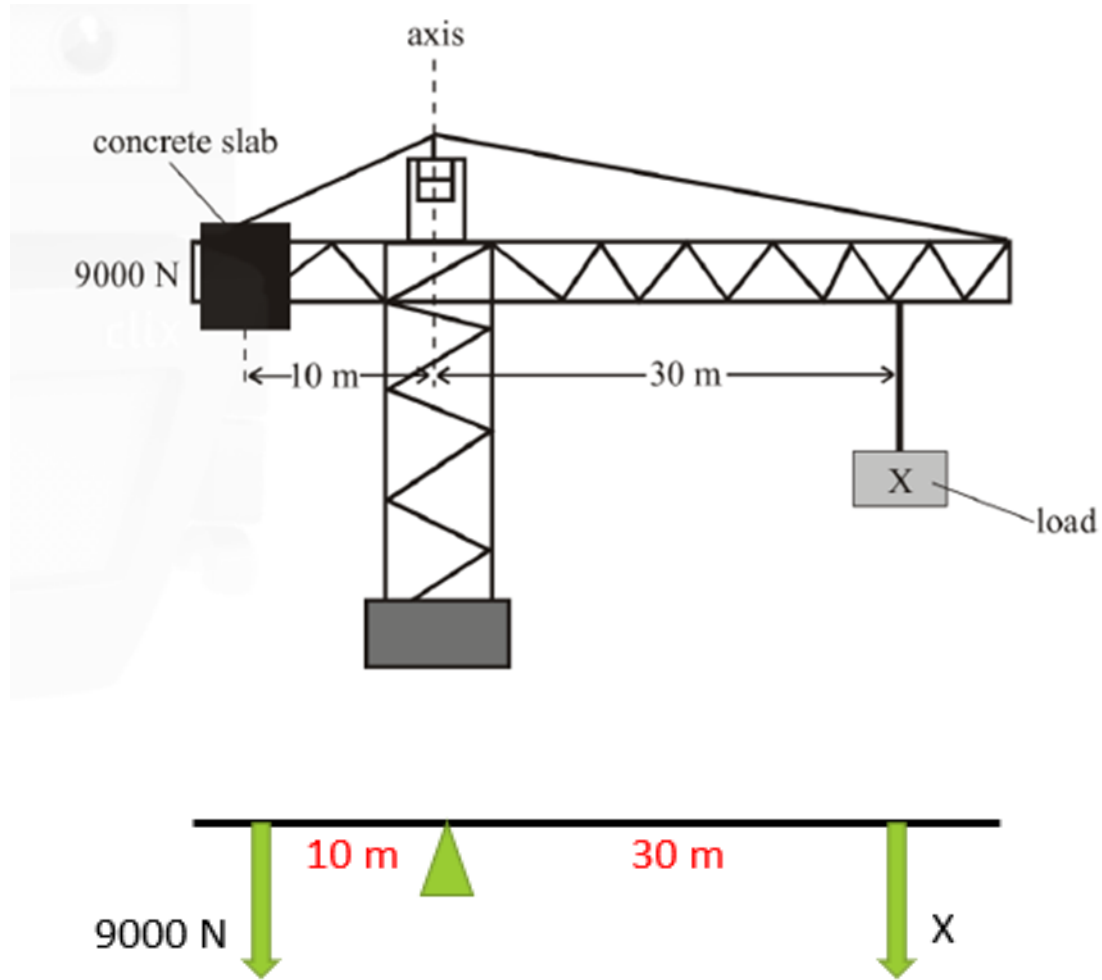


Tacoma narrows bridge collapse 1940

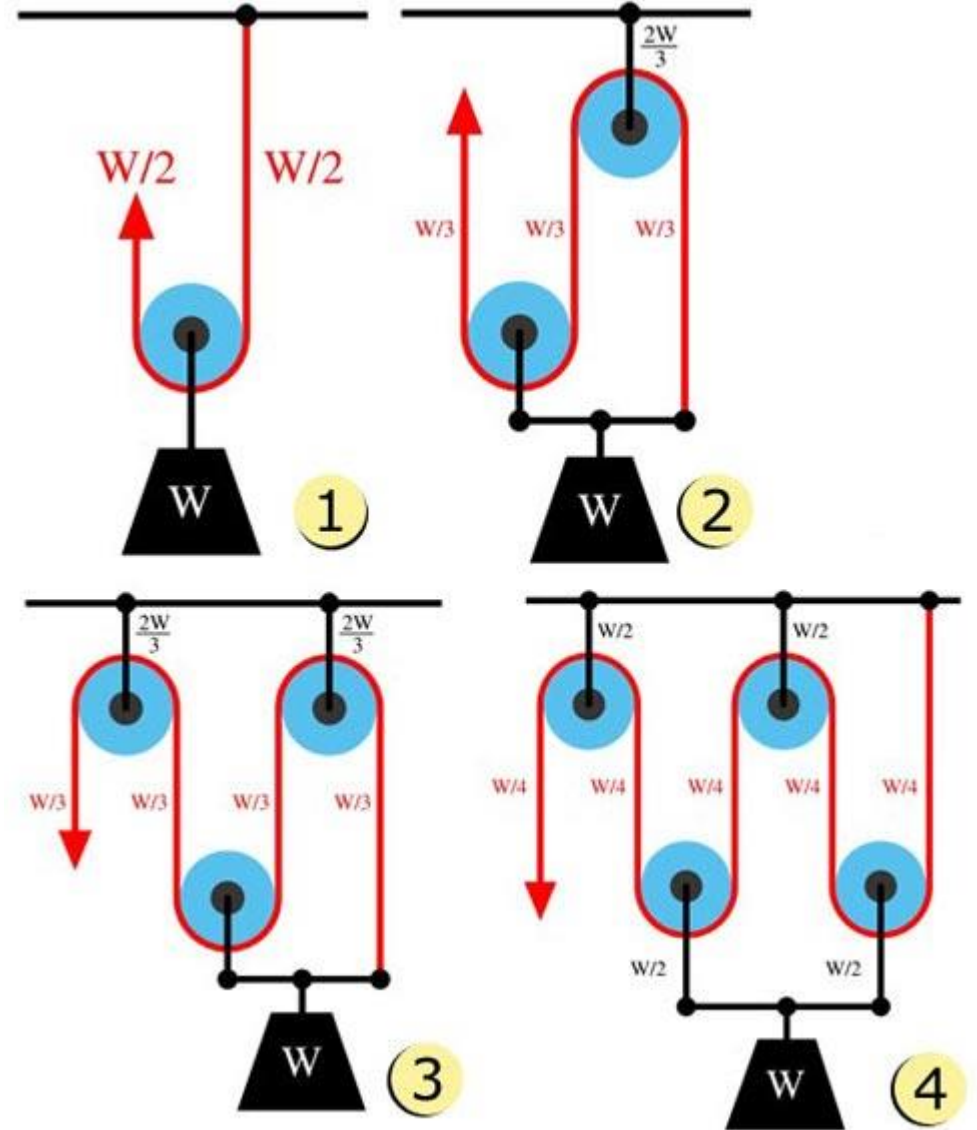
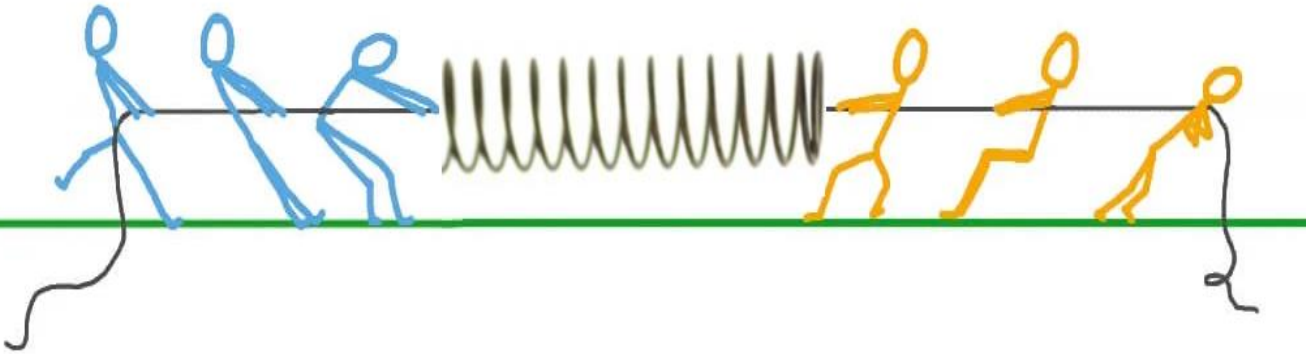
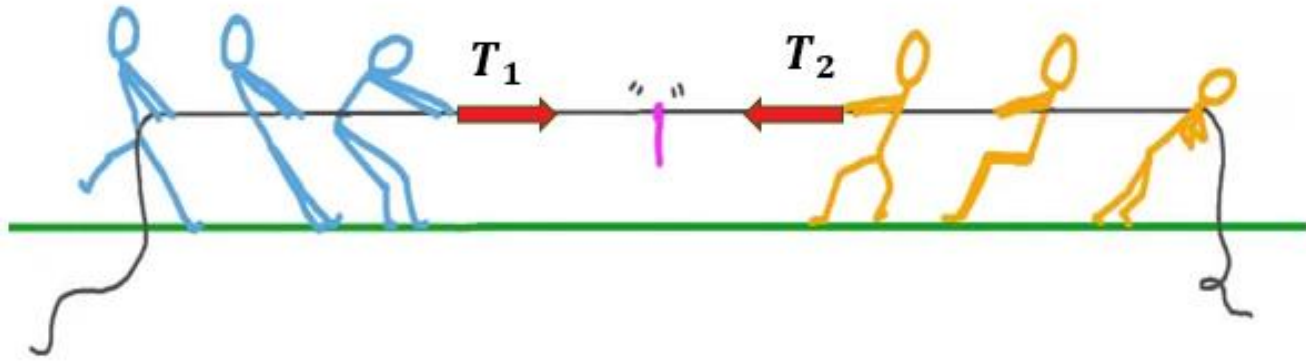


Resonance and Barton's pendulum

# The topic of Mechanics - - - - careers in civil engineering



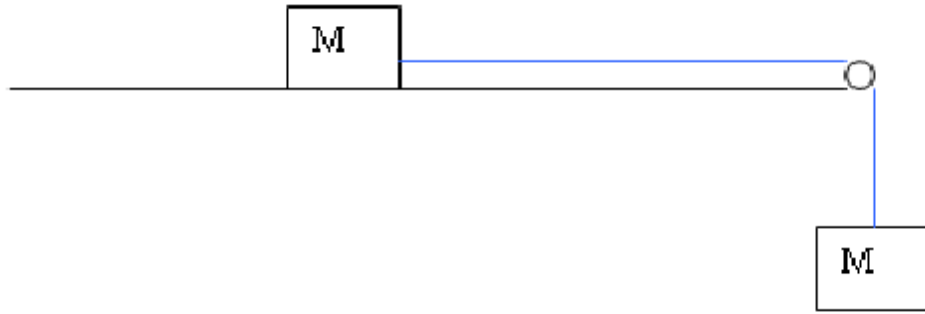
# Pulleys



# Problem solving

( elegant simplicity )

Two identical blocks of mass  $M$  are connected by a light inelastic string as shown which passes over a light frictionless pulley at the edge of the table. There is no friction between the block and the table. If the system is released from rest find the acceleration of each block

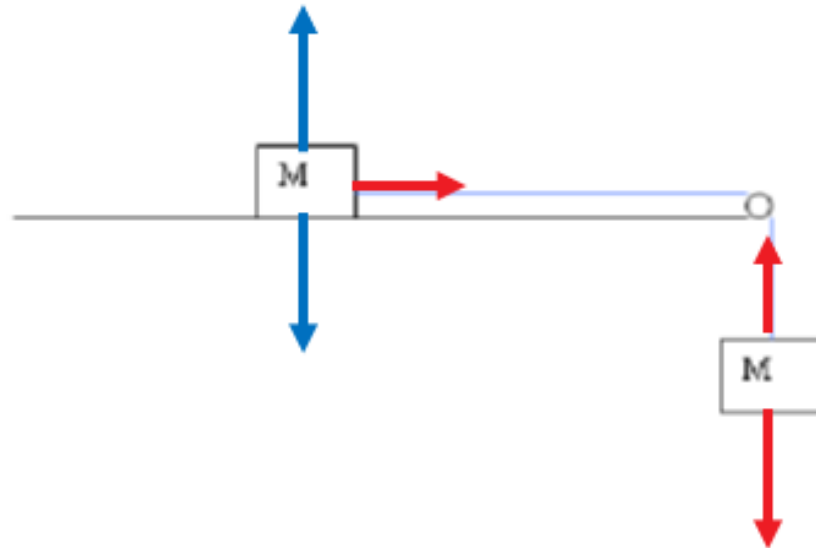


$$F = Ma$$

$$Mg - T = Ma$$

$$T = Ma$$

S3



$$Mg = 2Ma$$

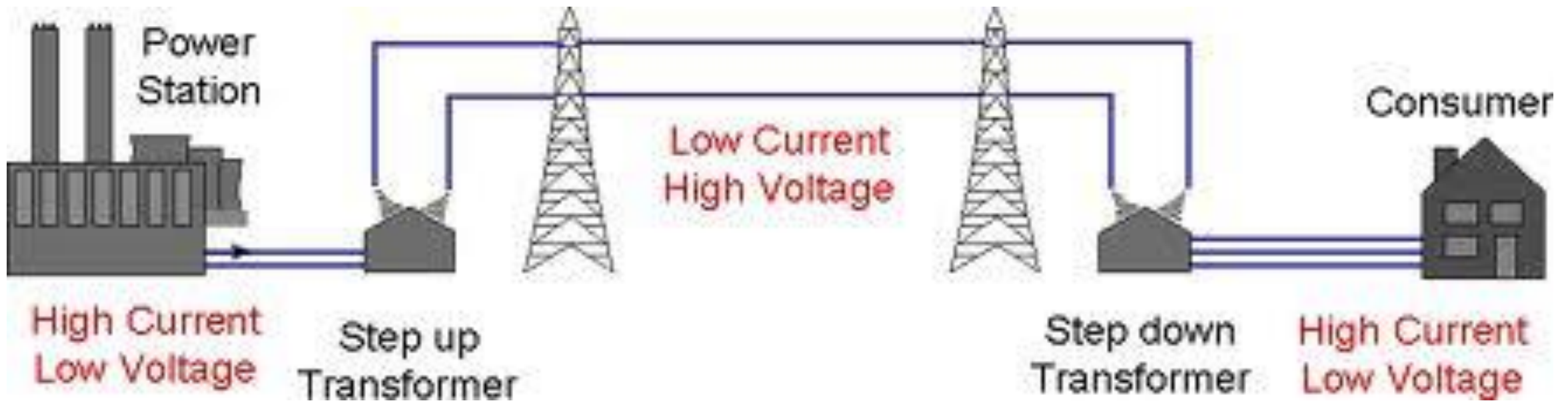
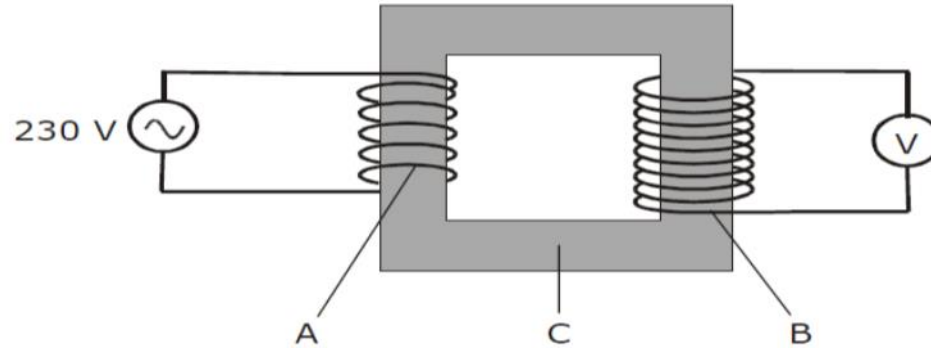
$$g = 2a$$

$$a = \frac{g}{2}$$

# Use of Transformers

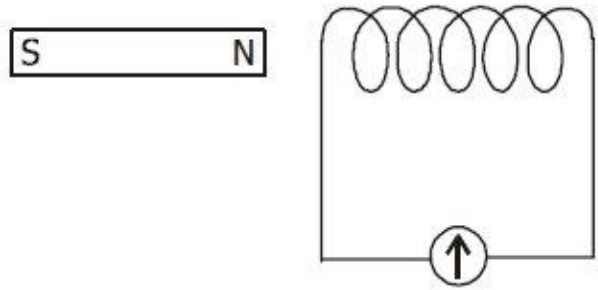
**Joule's law**

**Heat dissipates as the square of the current.**

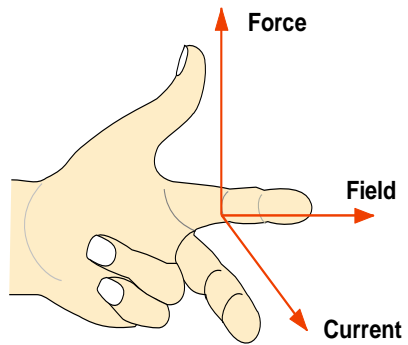




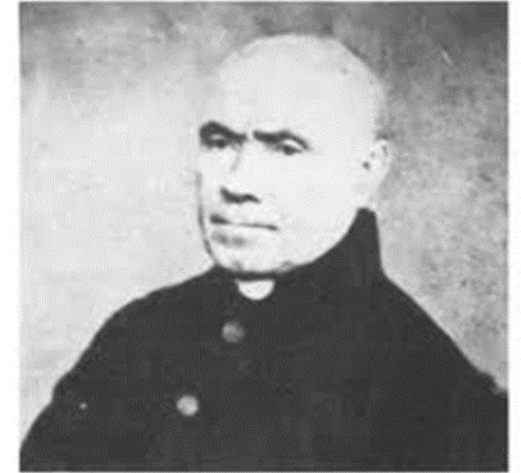
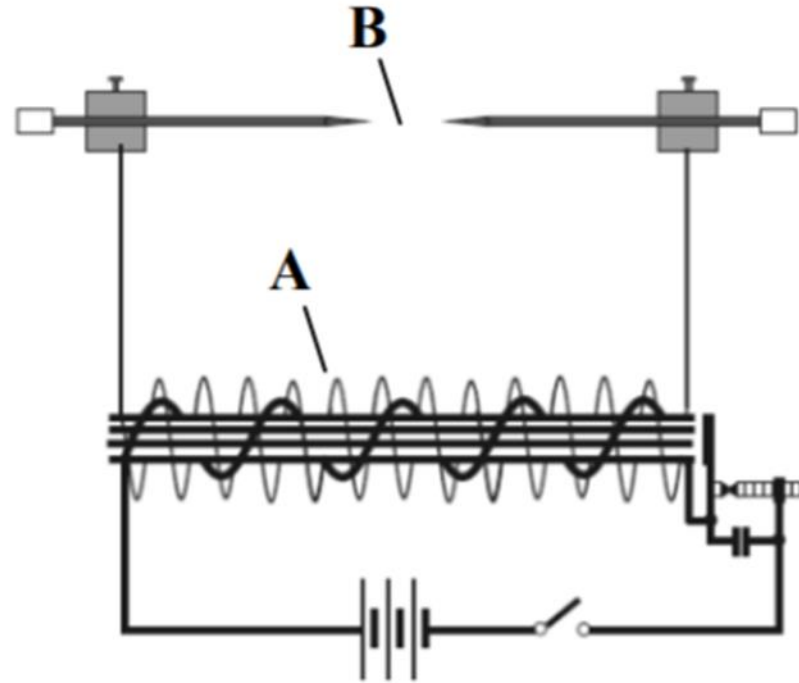
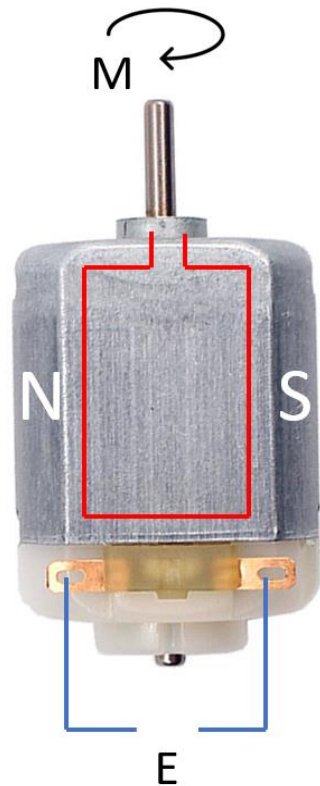
# Electromagnetism - - motors, generators, sparks



$$E = \frac{d\Phi}{dt}$$



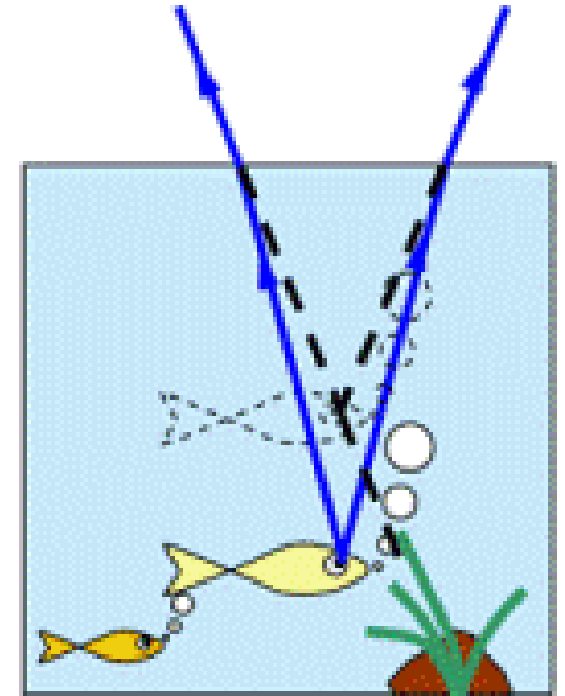
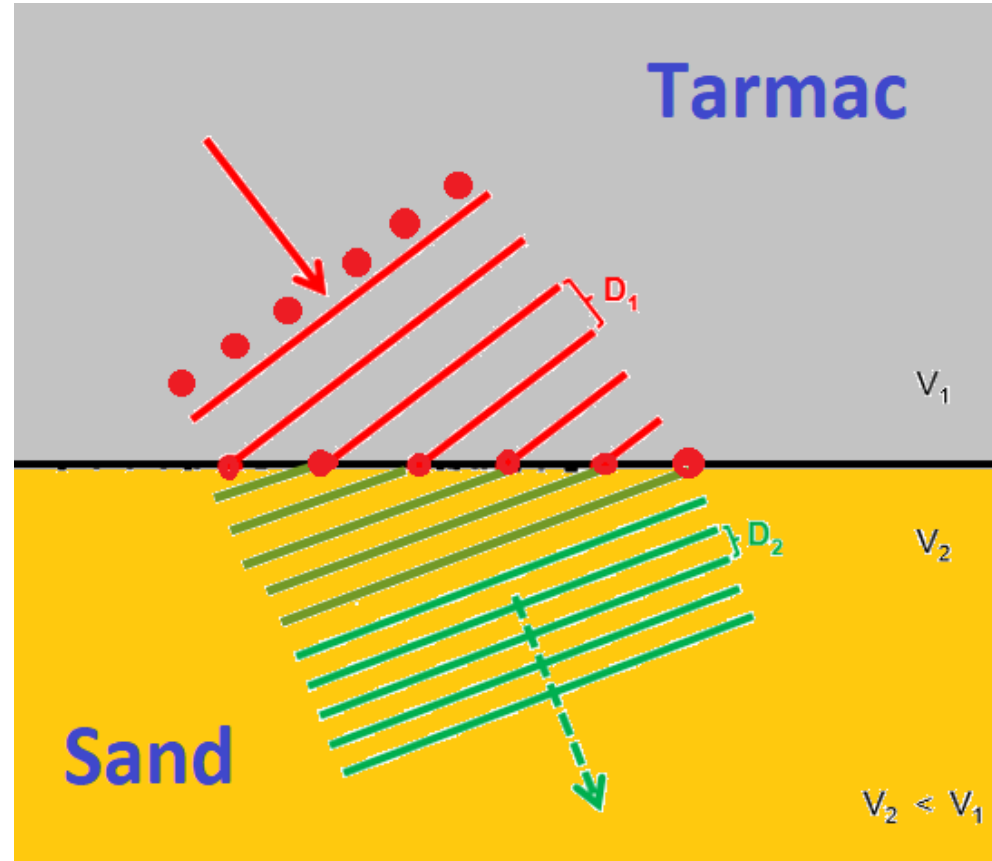
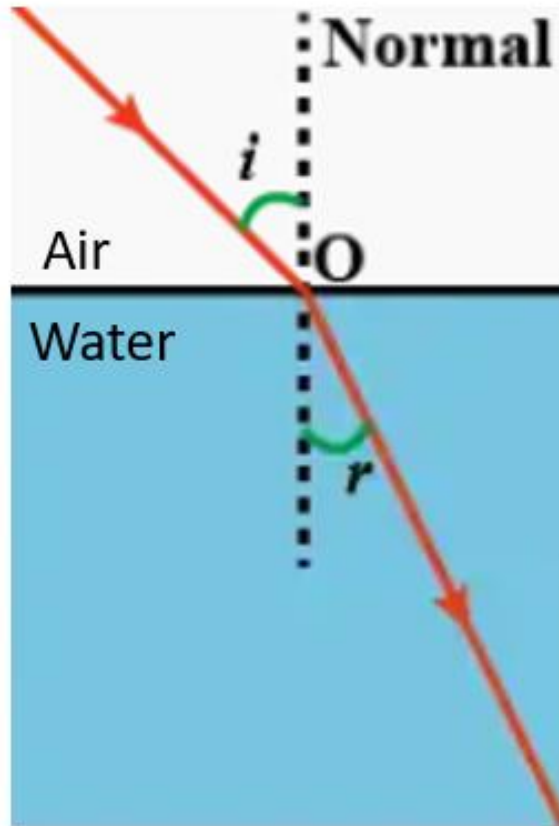
$$F = Bil$$



Nicholas Callan  
invented the  
induction coil in 1836

# Why does light change direction ?

## Refraction



Fermat's principle of least time can be useful here – a ray of light, travelling between two points, takes the path of shortest time.

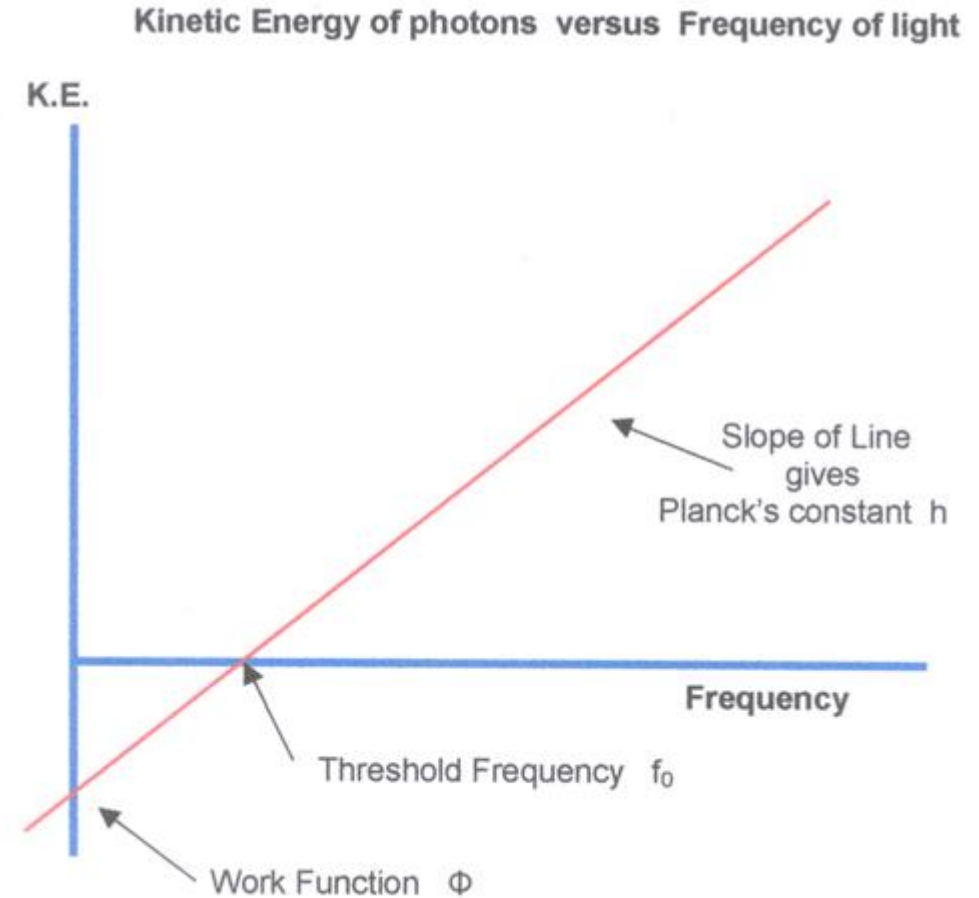
# Photoelectric effect



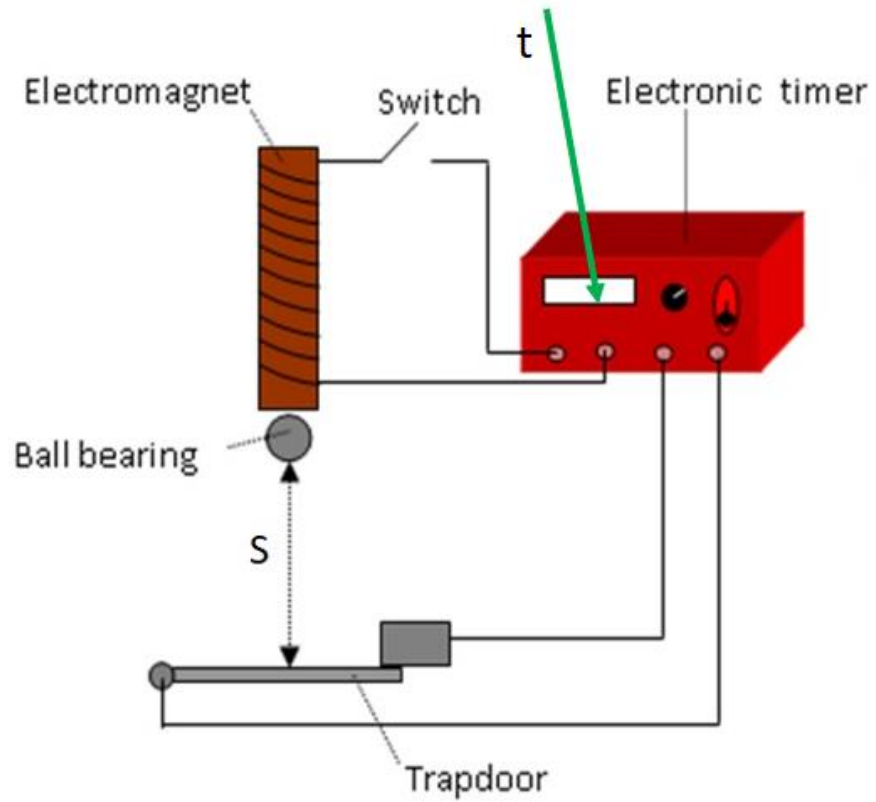
$$80 = 50 - 30$$

$$\frac{1}{2}mv^2 = hf - \phi$$

$$y = mx + c$$

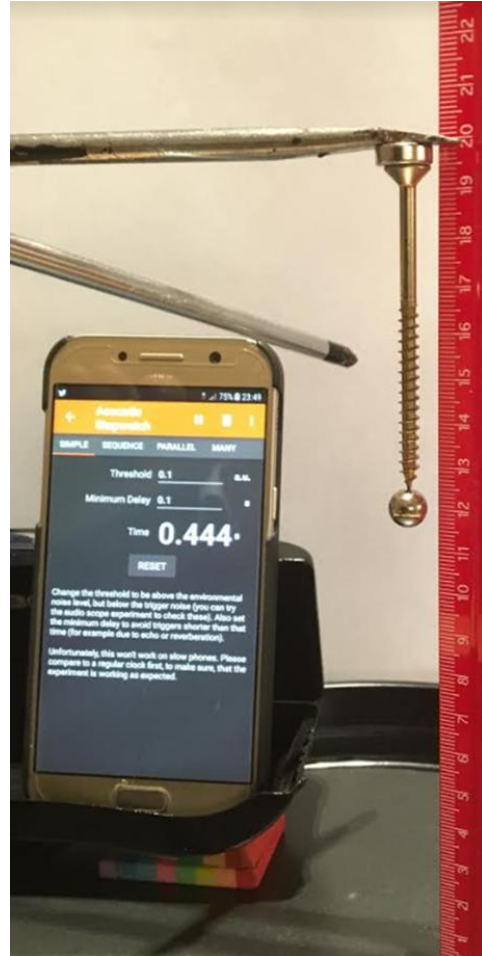


# g by freefall



$$s = ut + \frac{1}{2}gt^2$$

$$\text{If } u = 0 \quad \text{then } g = \frac{2s}{t^2}$$



**Phyphox app**  
Acoustic stopwatch

## Eamonn Lannoye

Eamonn is Managing Director of Electric Power Research Institute (EPRI).

He works with over 450 utilities around the world from his base in Dublin.

He emphasized that the electricity distribution network, referred to as the national grid, strives to optimize reliability, affordability and sustainability.

Transformers are a critical component of their operation and unfortunately there is a worldwide shortage of transformers.

He emphasized that people don't like to live where wind generation is optimal, and so, one of the challenges is getting electricity from generator to consumer.

The lack of consistency of output of renewables necessitates "pumped storage" facilities like Turlough hill, etc.

## Female engineers (video)

Elaine Galloway told us about her work in electrical and electronic engineering.

Jennifer Keenahan told us about her work in civil engineering and she illustrated it with 3 examples of the use of computational fluid dynamics, in bridge monitoring, coastal defences and helicopter rotor-down-wash effect.

Leanne Leonard highlighted the difference between a level-7 course in engineering that prepares one for a role as a site engineer and a level-8 course that prepares one to be a consultant engineer.

## Ken Keohane

Ken is a senior manager in ThermoFisher Scientific in Cork.

As an engineer, he worked initially in medical devices.

Then he moved to the UK and worked in the food industry.

Since returning to Ireland nearly 20 years ago he has worked mostly in the pharmaceutical industry, with Glaxo, Smith, Kline who in recent times were taken over by ThermoFisher.

As an engineer one is constantly evolving and adapting.

IOP Spring Conference, 6 April 2024 Dublin



[Home](#) [Register](#) [Rosse Medal](#) [Programme](#) [Venue](#) [Contacts](#)

# Ireland Spring Conference 2024

**Rosse Medal competition, showcasing postgraduate research,**  
**Keynote speaker: Prof. Lorraine Hanlon Director of C-Space (UCD)**  
Dr. Luca Matra, TCD, Excomets researcher  
Prof. Sinéad Ryan, TCD, Theoretical High Energy Physics.  
Themes: membership of ESO and associate membership of CERN.  
**Plus, networking opportunities and an evening dinner.**

**6 April 2024**

Royal College of Surgeons, Dublin, Ireland





# Electronics workshop: An introduction to simple circuits

## Upcoming Elective Workshop

### Electronics Workshop 1: An Introduction to Simple Circuits



Oide



Date	Venue	Time
Thursday 7th March	Monaghan EC	19:00 – 21:00
	Athlone EC	
Tuesday 19 March	Galway EC	19:00 – 21:00
	Dublin West EC	
Thursday 21st March	Limerick Education Support Centre	19:00 – 21:00
	Cork Education Support Centre	
	Kilkenny EC	

Attendees will receive an electronic components resource kit.

No. of Places: **25**

<https://oide.ie/apply-book-now/teachers/>

Tacú leis an bhFoghlaim  
Ghairmiúil i measc Ceannairí  
Scoile agus Múinteoirí

Supporting the Professional  
Learning of School Leaders  
and Teachers

<https://oide.ie/apply-book-now/teachers/>

**IOP** Institute of Physics

# Oide LC Physics Lab Days



**Oide**

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Ghairmiúil i measc Ceannairí  
Scolle agus Múinteoirí

Supporting the Professional  
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## Leaving Certificate Physics

### Practical Laboratory Days

The Oide Physics team are delighted to present a practical hands-on day for all new and experienced Physics teachers.

The lab day will include:

- Conducting some of the mandatory experiments
- Engaging in practical demonstrations
- Examining and using a variety of apparatus
- Exploring inquiry-based learning
- Encouraging a sharing of resources



bitly

<https://oide.ie/apply-book-now/teachers/>

These practical laboratory days will take place face-to-face on each of the following dates:

Saturday  
24th February 2024

10am-4pm

Castleknock College,  
Dublin

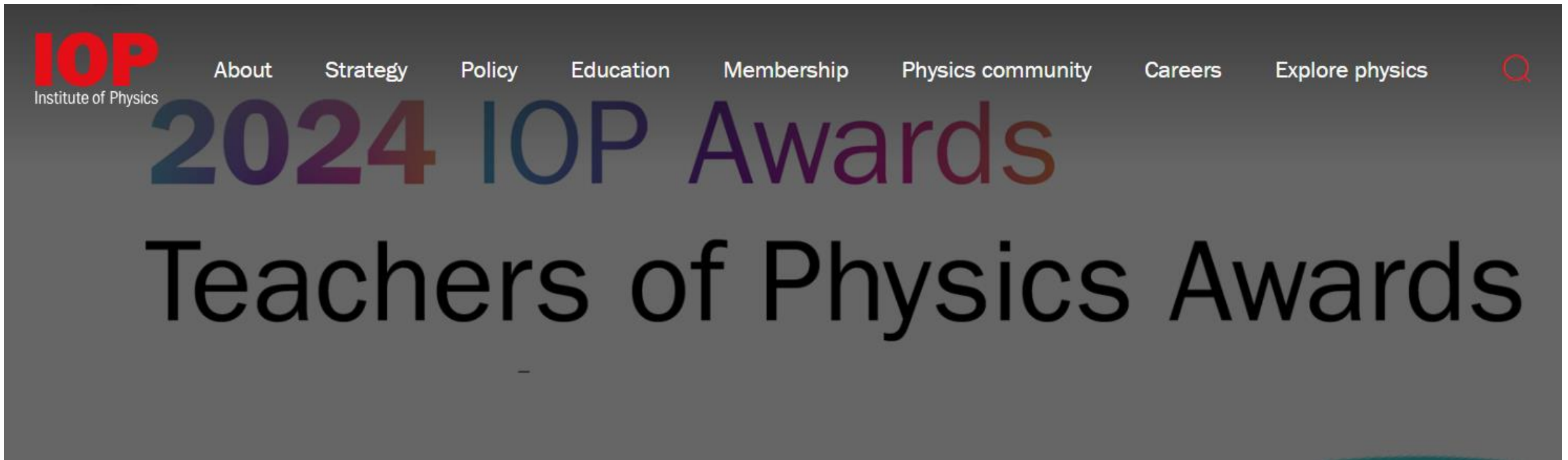
Saturday  
9th March 2024

10am-4pm

Regina Mundi College,  
Cork

**IOP** Institute of Physics

# IOP Teacher of Physics Award



<https://www.iop.org/about/awards/teachers-physics-awards>

The winners receive a prize of £1,000, an engraved glass paperweight and a certificate. The nominations for the 2024 IOP Teacher of Physics Awards close at midday on Saturday 30 March 2024

**IOP** Institute of Physics

# The next IOP Physics Hub

Next IOP Physics Hub will be on Thursday 14 March

Booking at:

<https://spark.iop.org/events>

or

<https://www.smartsurvey.co.uk/s/QA0502/>

Resources including Notes, Weblinks & presentations  
are available at the following link will be emailed to attendees

**IOP Physics Hub**

<https://spark.iop.org/events>

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