

Hub-98 Ireland's Physics Heritage

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

Theme: **Ireland's Physics Heritage**

David Keenahan

Paul Nugent

Eoin Gill



Madeline Hickey

IOP Physics Coach

IOP Physics Coach

Co-founder & Co-Director of CALMAST

Robert Boyle Summer School¹

Maths Week, Ireland

NCSE

<https://www.tcd.ie/physics/300/>



300



Tercentenary of Physics in Trinity | 1724 – 2024

IOP Institute of Physics

Paul Nugent's presentation

Paul did a presentation at the Brecon conference in 2021 entitled

**Some of
Ireland's
Greatest
Physicists**

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 @PhysicsIreland



https://drive.google.com/file/d/1vp_2GjixsVkAQ-e50TwCrMblvj-Fbi5Y/view

It is available at:

[Some of Irelands Greatest Physicist.pdf - Google Drive](#)

Hub resources on Padlet

dkeenahan • 4d

IOP Physics Hub padlet

Resource area

Hub 91 to 97

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- Hub-97_Make-it-yourself Physics**
 - [Hub-97 Notes and Resources](#)
 - [Hub-97 Presentation](#)
- Hub-96_Circuits**
 - [Hub-96 Notes and Resources](#)
 - [Hub-96 Presentation](#)
- Hub-95_Engineering**
 - [Hub-95 Notes and Resources](#)
 - [Hub-95 Presentation](#)
- Hub-94_Spectra**
 - [Hub-94 Notes and Resources](#)
 - [Hub-94 Presentation](#)

Hubs 81 to 90

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- Hub-81_Electricity**
 - [Hub-81 Notes and Resources](#)
 - [Hub-81 Presentation](#)
 - [Rory - Electric Potential](#)
 - [Rory - Current and Voltage](#)
- Hub-82_Brecon-2023**
 - [Hub-82 Notes and Resource](#)
 - [Hub-82 Chatlog Physics World](#)
 - [Rory using Archimedes for Density](#)
- Hub-83_Oscillations**
 - [Hub-83 Notes and Resources](#)
 - [Rory presentation: Waves & radio](#)
 - [Hub-83 presentation](#)
- Hub-84_Popular Physics**

Hubs 71 to 80

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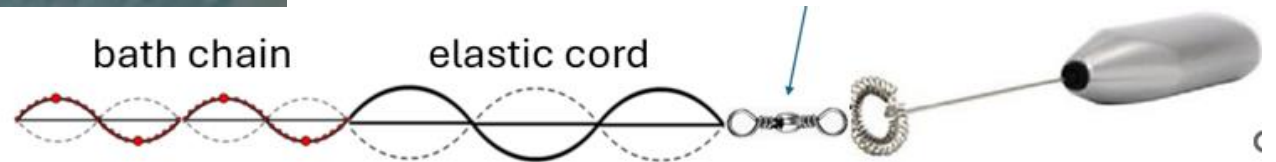
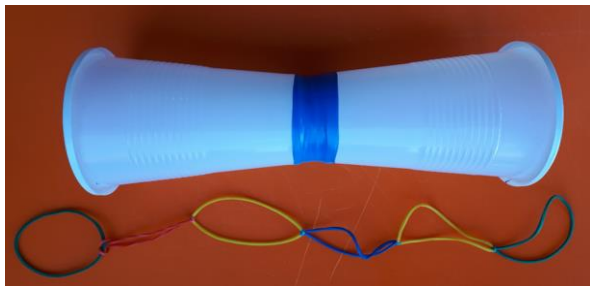
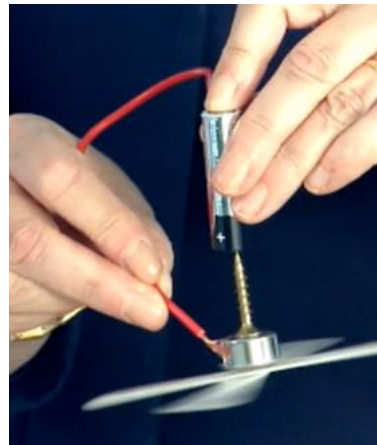
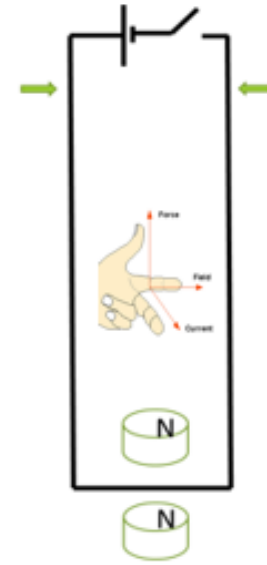
- Hub-71_Dyscalculia**
 - [Notes and Resources](#)
 - [Hub-71 Presentation](#)
 - [Anne O'Shea - Dyscalculia](#)
- Hub-72_X-rays**
 - [Notes and Resources](#)
 - [Hub-72 Presentation](#)
- Hub-73_Inclusive Physics**
 - [Notes and Resources](#)
 - [Hub-73 Presentation](#)
 - [Will Stark vision impaired physics](#)
- Hub-74_Force**
 - [Notes and Resource](#)
 - [Hub-74 Presentation](#)

Hubs 61 to 70

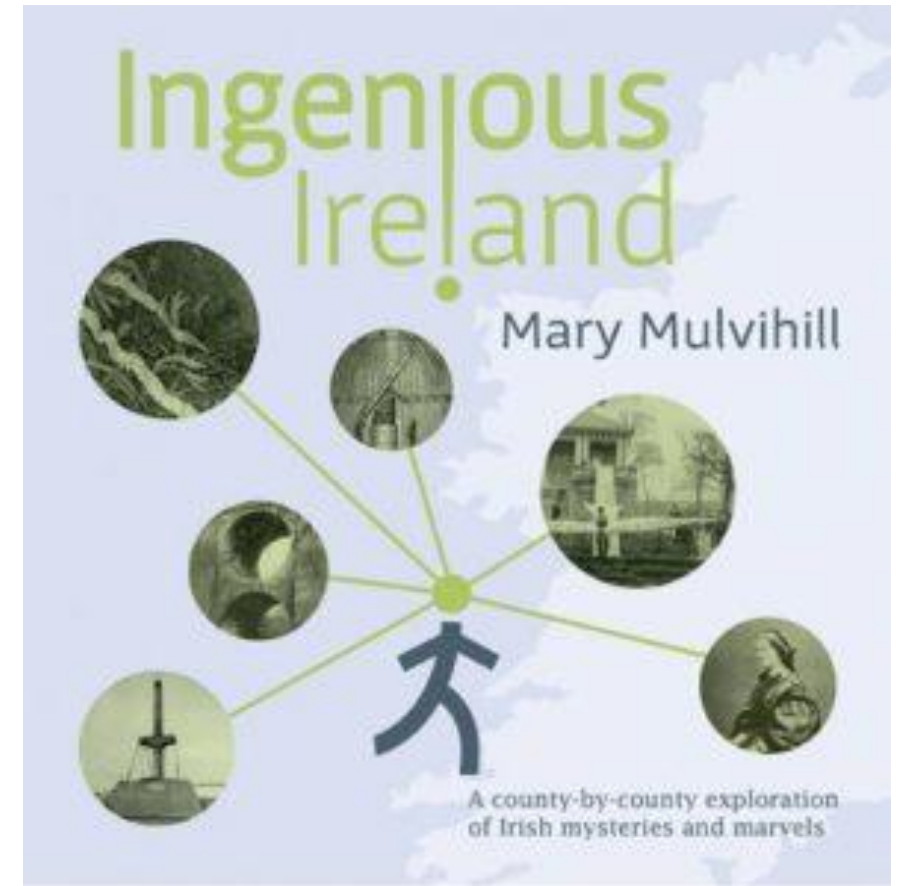
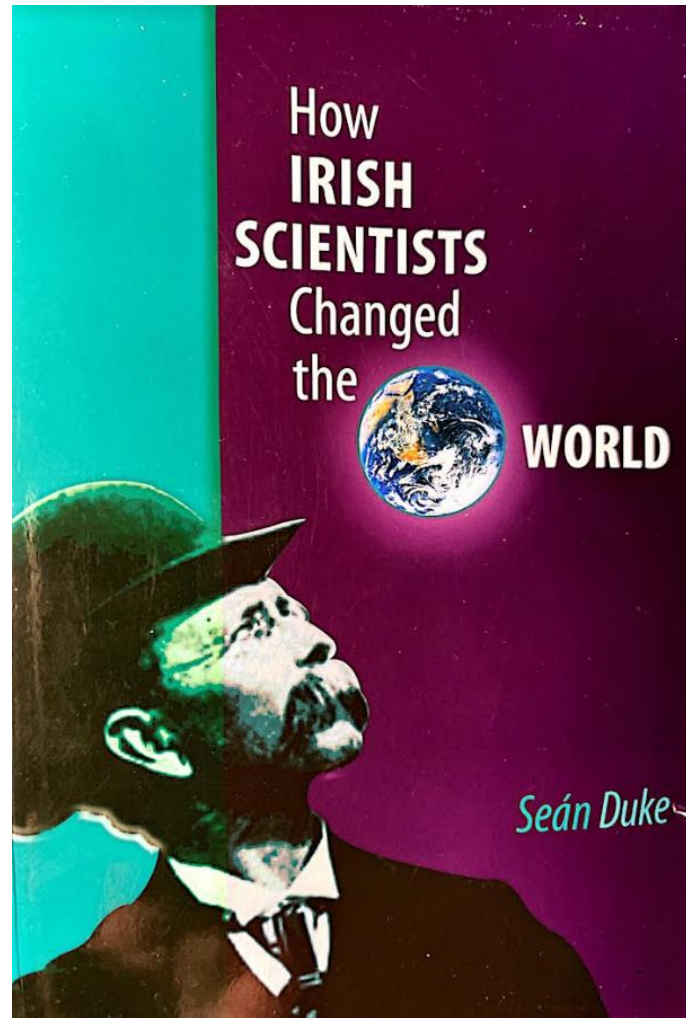
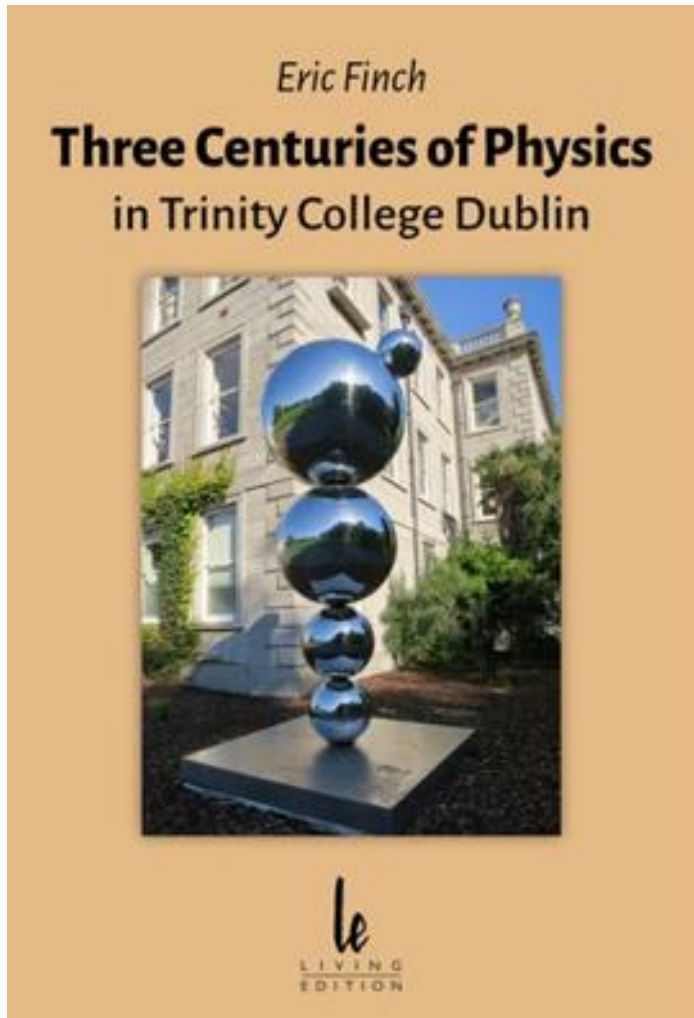
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- Hub 61_Success & Success**
 - [Notes and Resources](#)
 - [Success - Richard Moynihan](#)
 - [Structure strips - R Moynihan](#)
 - [Solar Eclipse 1 - R Geoghegan](#)
 - [Solar Eclipse 2 - R Geoghegan](#)
- Hub 62__Science Week 2022**
 - [Notes and Resources](#)
 - [Hub-62 Presentation](#)
 - [Science--Tullamore - Noreen Flynn](#)
 - [Paper Poppers - Mary Gorey](#)
 - [Sample Science Week Programme](#)
- Hub-63_Physics Help**
 - [Notes and Resources](#)
 - [Hub-63 Presentation](#)

Homemade demonstrations can have great impact

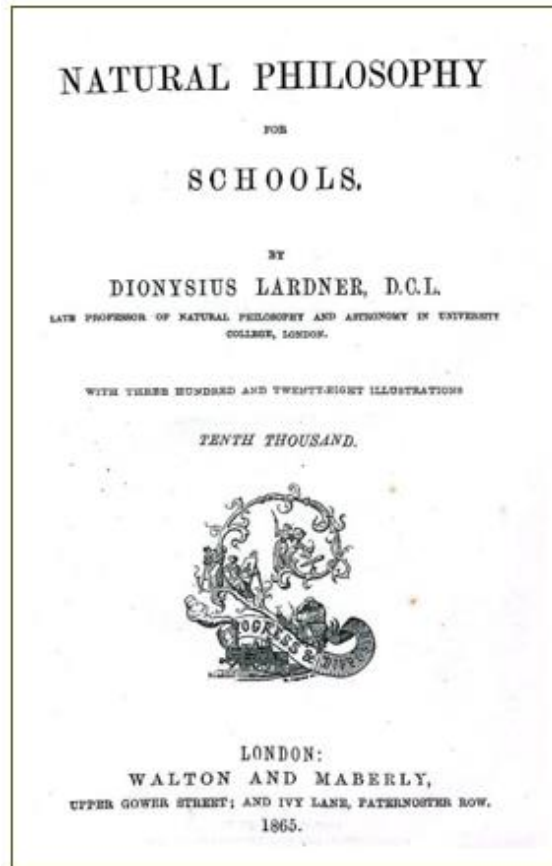


Some books relevant to Ireland's Physics Heritage

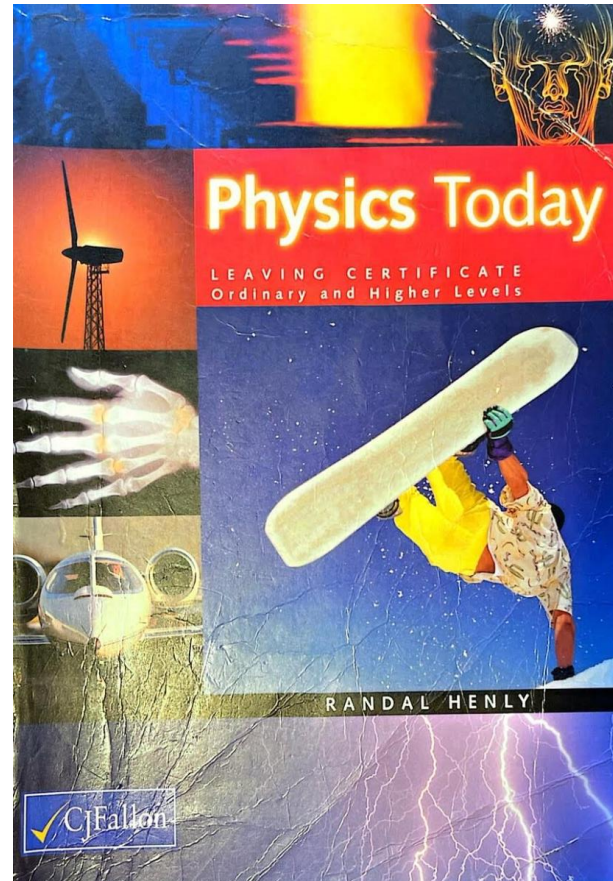


Some school Physics textbooks

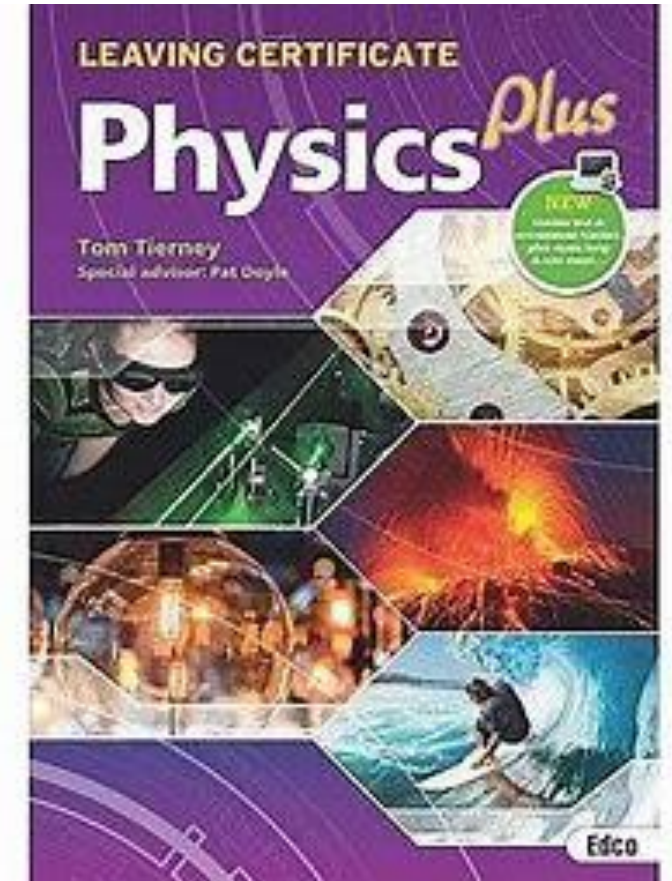
Dionysius Lardner



Randal Henly



Tom Tierney



Eoin Gill presented on the life and work of
Robert Boyle
Nicholas Callan
John Tyndall

Eoin's presentation will be emailed to attendees

William Molyneux published his Optics 12 years before Newton did

William Molyneux was born in Dublin in 1656

He attended St Patrick's grammar school and Trinity College Dublin

His wife Lucy lost her sight due to illness a few months into their marriage

This led William to an interest in the science of visual perception.

His research on lenses and refraction culminated in [Dioptrica nova](#) (1692), the first major work on optics in the English language.

Molyneux's book on optics was published 12 years before Newton published his Opticks (in English, not Latin as used for Principia).

Molyneux's book covered:

geometrical optics related to lenses, the human eye, telescopes, microscopes and spectacles.

William Molyneux was a regular attender at [St Audoen's Church](#) in Dublin where he is buried

Copies of his book are in Marsh's library.



The Molyneux problem - - a philosopher's challenge

The "Molyneux problem" posits a man who has been blind from birth and who has learned how to distinguish between a sphere and a cube using only his sense of touch. It asks whether the man on acquiring sight could immediately and correctly identify the objects through his newfound power of vision.

Molyneux answered the question in the negative, on the grounds that visual perception requires experience.

Edith Stoney

first woman medical physicist

Edith Anne Stoney was born in Dublin in 1869

(daughter of George Johnstone Stoney (electron))

She became a physicist and is considered the **first woman medical physicist**.

Edith Stoney was very talented at mathematics and won a scholarship to Cambridge. She got a First in her exams (1893), but Cambridge didn't award degrees to women at that time.

Edith was appointed as a physics lecturer at the school of Medical Physics for Women in the University of London in 1899.

She set up the physics laboratory and designed the physics course.

Edith Stoney resigned her post in 1915 to establish and run field hospitals during the 1st World War.

These hospitals near the front line, operated x-ray facilities to localise bullets and shrapnel

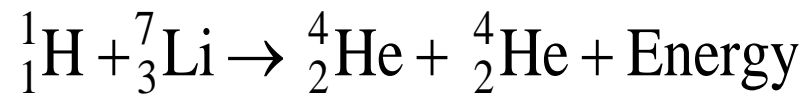
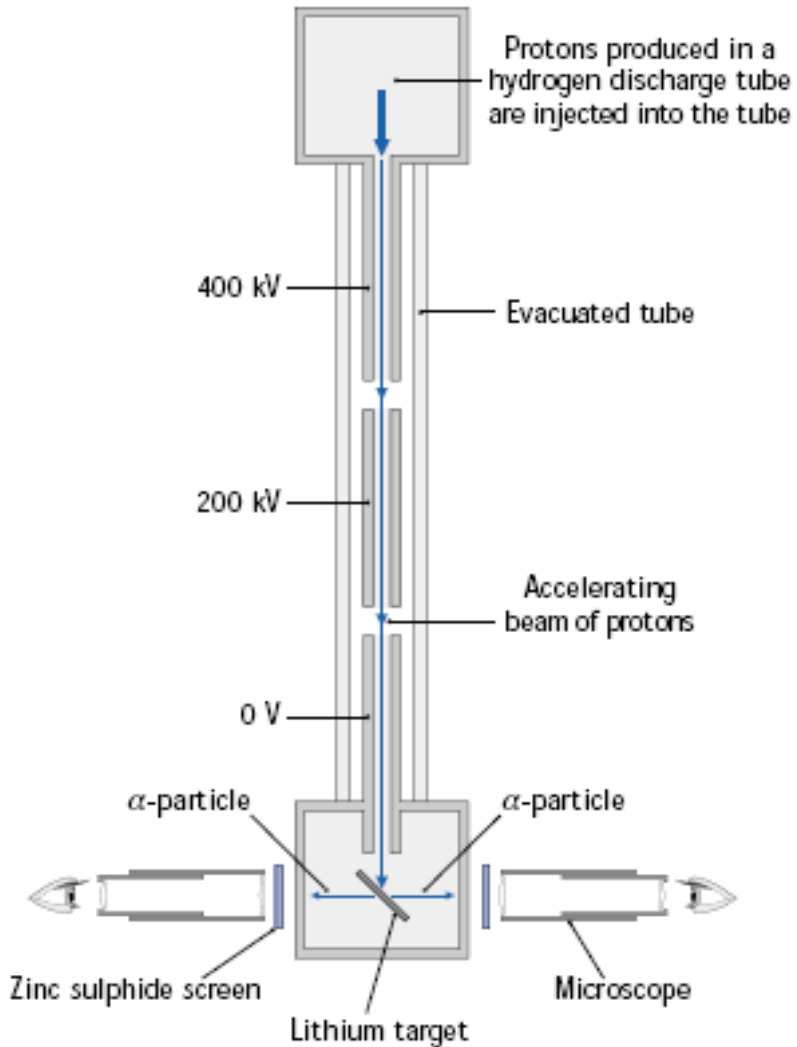
Edith Stoney was decorated for her war service, by several countries, and died in 1938, at the age 69



Cockroft and Walton “split the nucleus” in 1932

Ernest Walton was born in Dungarvan and educated at Methodist College Belfast and Trinity College and worked under Rutherford at Cambridge

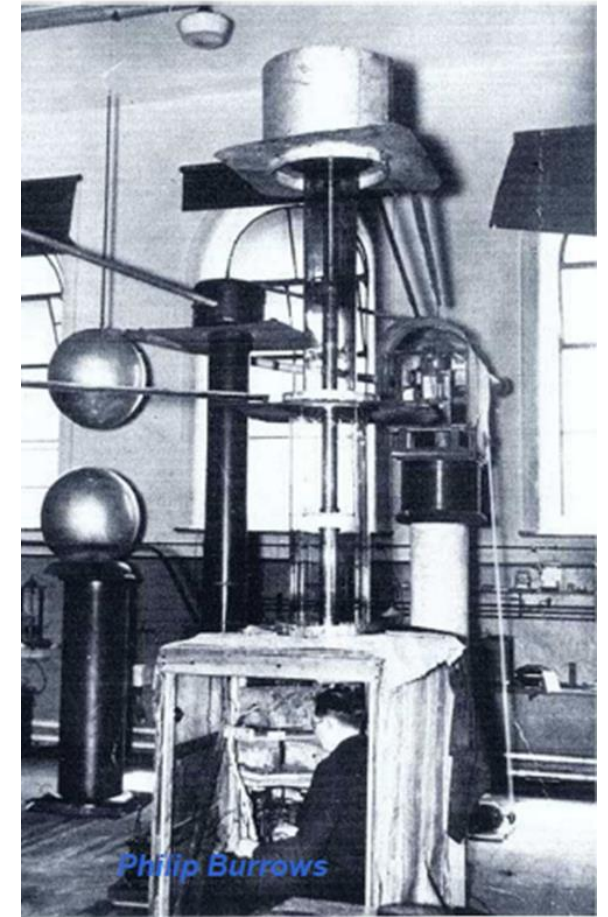
Protons accelerated by 80,000 Volts



1 MeV

17.3 MeV

Experimental verification of $E = mc^2$



IOP Institute of Physics

Thomas Romney Robinson

Thomas Romney Robinson, was the director of **Armagh Observatory** for **59 years** from his appointment in **1823**.

He was also the rector of **Carrickmacross** while serving at the observatory

He invented the **4-cup anemometer** in **1846** to measure wind speed.

When the wind blows, the cups experience a force that causes the shaft to rotate.

The rate of rotation is roughly proportional to the wind's speed.

By counting the shaft's revolutions over a set time interval, we obtain a value that is proportional to the **average wind speed**



THE ROBINSON ANEMOMETER.

Jocelyn Bell Burnell

Jocelyn Bell was born in Lurgan, Co. Armagh

She gained a BSc from Glasgow University. PhD from Cambridge University

Pulsars discovered by Jocelyn Bell Burnell in 1967

Pulsars are rapidly rotating neutron stars, that emits regular pulses of radio waves at rates of up to one thousand pulses per second.

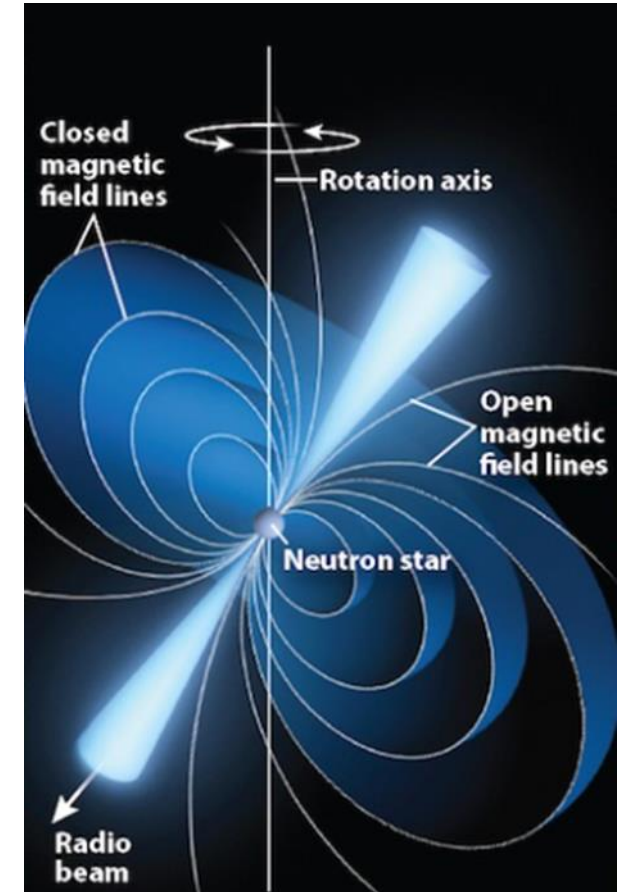
Neutron stars are about 20 km in diameter but with a mass greater than that of our sun.

They are therefore incredibly dense—about 10^{14} times that of water.



Hear her account of how she discovered pulsars at:

<https://www.youtube.com/watch?v=-335gUOvdhA>



George Gabriel Stokes (1819–1903) was an Irish mathematical physicist.

He was born in Sligo and spent 54 years as Professor of Mathematics at Cambridge University until his death in 1903.

He studied the behaviour of fluids and viscous flow and laid the foundation of Fluid Dynamics:

The **Navier-Stokes equations**, which describe fluid motion, bear his name and remain fundamental in physics and engineering.

The Stokes equation arise from applying Newton's second law to fluid motion and taking viscosity into account and making certain assumptions.

Stokes also made a significant discovery in **medicine where he** demonstrated that **hemoglobin** in blood is responsible for transporting oxygen..



John Stewart Bell was born in Belfast and attended Queens

He made a profound impact on the field of quantum physics through **Bell's theorem**, which has far-reaching implications:

Bell's work inspired experimental tests known as **Bell inequality tests**.

Aspect, Clauser, and Zeilinger received the **Nobel Prize in Physics in 2022** for their work on Bell inequalities and the experimental validation of Bell's theorem

Bell's theorem highlighted the **non-classical nature** of quantum mechanics and the importance of entanglement

His work has implications for quantum computing,



William Thomson became Lord Kelvin

William Thompson was born in Belfast in 1824

His father was an engineer and mathematician at the **Royal Belfast Academical Institution**.(RBAI)

At the age of 8, William moved to live in Glasgow where his father was appointed as a professor of mathematics at the **University of Glasgow**.

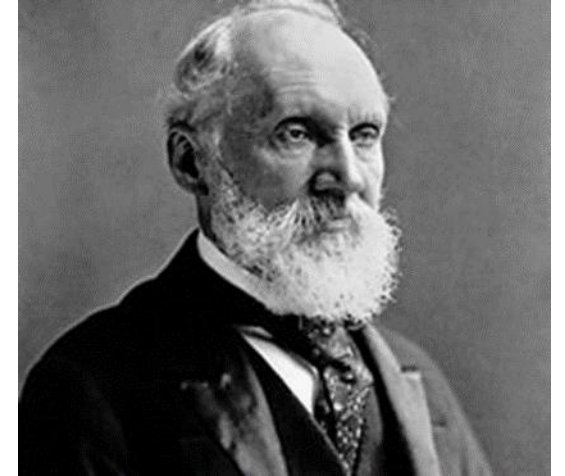
William Thomson was Professor at the University of Glasgow for 53 years.

He formulated the **first and second laws of thermodynamics**, which are fundamental principles governing energy and heat transfer.

He became Lord Kelvin

We remember him for the Kelvin Scale of Temperature and absolute zero (where molecular motion ceases)

He played a major role in guiding the first transatlantic cable which revolutionized communication in its day. (3500 km cable joining Valentia, Co Kerry to Newfoundland)



A Dionysius Lardner

Dionysius Lardner was born in Dublin

After years of lecturing in Trinity College Dublin and University College London, he focused on producing books on a wide variety of themes.

In 1857, following many other successful publications, he produced a textbook titled "*Natural Philosophy for schools*".

It appears to be one of the earliest texts to possess the modern subject core of mechanics, light, sound and electricity and magnetism.



Sheila Tinney mathematical physicist - - quantum physics

Sheila Tinney was born in Galway and studied at UCD and came top of the class earning a BSC in Mathematics in 1938.

Following a Masters in 1939 she studied at the **University of Edinburgh**. Under the guidance of physicist **Max Born**, she earned her **PhD in 1941** for her work on the **stability of crystal lattices**

Tinney became one of the first three scholars appointed to the newly established **Dublin Institute for Advanced Studies (DIAS)** in **October 1941**

While at DIAS, she collaborated with eminent physicists such as **Paul Dirac**, and **Erwin Schrödinger**.

She specialized in **quantum physics**

Sheila Tinney returned to **University College Dublin**

She developed the **first mathematical courses on quantum mechanics** at UCD and taught the subject to generations of students



William Rowan Hamilton (1805 - 1865)

William Rowan Hamilton was born and lived in Dublin

He was a mathematician, astronomer, and physicist.

Hamilton made outstanding contributions to classical mechanics and optics

Hamilton's most famous creation is the **algebra of quaternions**, an extension of complex numbers.

In working with four dimensions, rather than three, he created quaternion algebra.

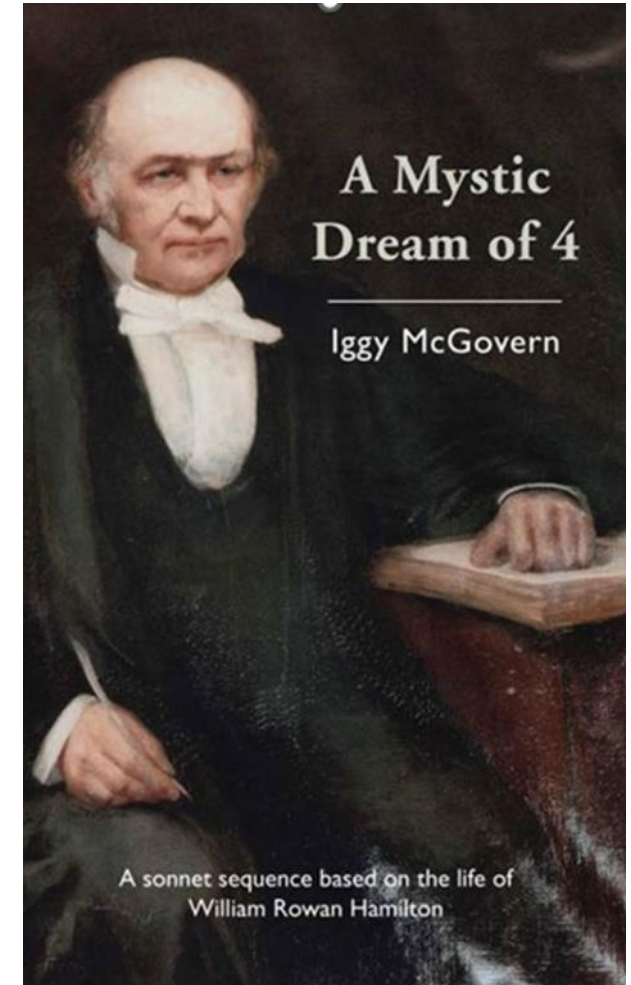
A cornerstone of quaternions is the equation.

$$i^2 = j^2 = k^2 = ijk = -1$$

which occurred to Hamilton as he walked by the Royal Canal in Dublin.

Quaternions find applications in computer graphics, robotics, and quantum mechanics.

Hamilton served as the **Royal Astronomer of Ireland** and worked at the **Dunsink Observatory** from **1827 to 1865**.



George Francis Fitzgerald (1851 – 1901)

George Francis Fitzgerald was born in Dublin

He entered Trinity College Dublin at 16 after winning a scholarship

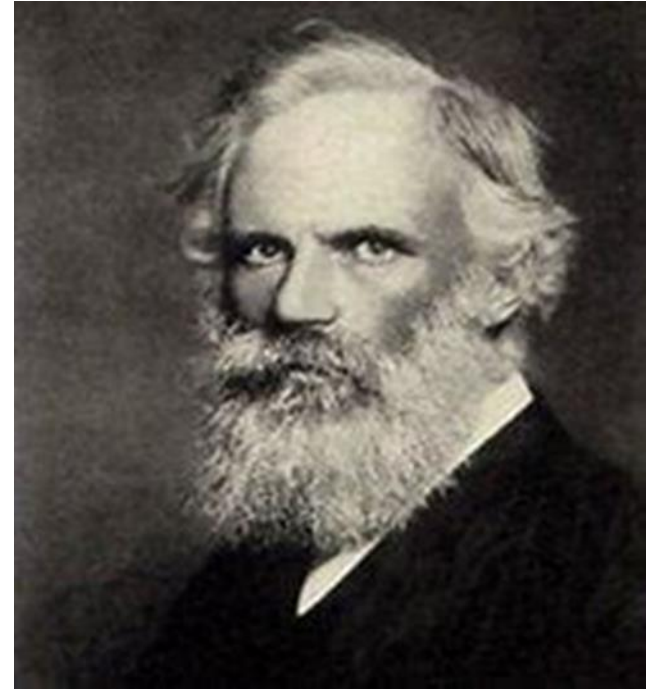
He was influential in confirming Maxwell's equations.

He is famous for Lorentz–FitzGerald contraction
(became integral part Einstein's special theory of relativity)

Equation
$$L = L_0 \sqrt{1 - v^2 / c^2}$$

L is the length observed by an observer in motion relative to the object

L_0 is the proper length (the length of the object in its rest frame)



The story of Brother Potamian's 1896 x-ray in Waterford

Michael Francis O'Reilly became Bro. Potamian on joining De La Salle order.

He joined the Order at age 12 in 1859 and trained in Canada.

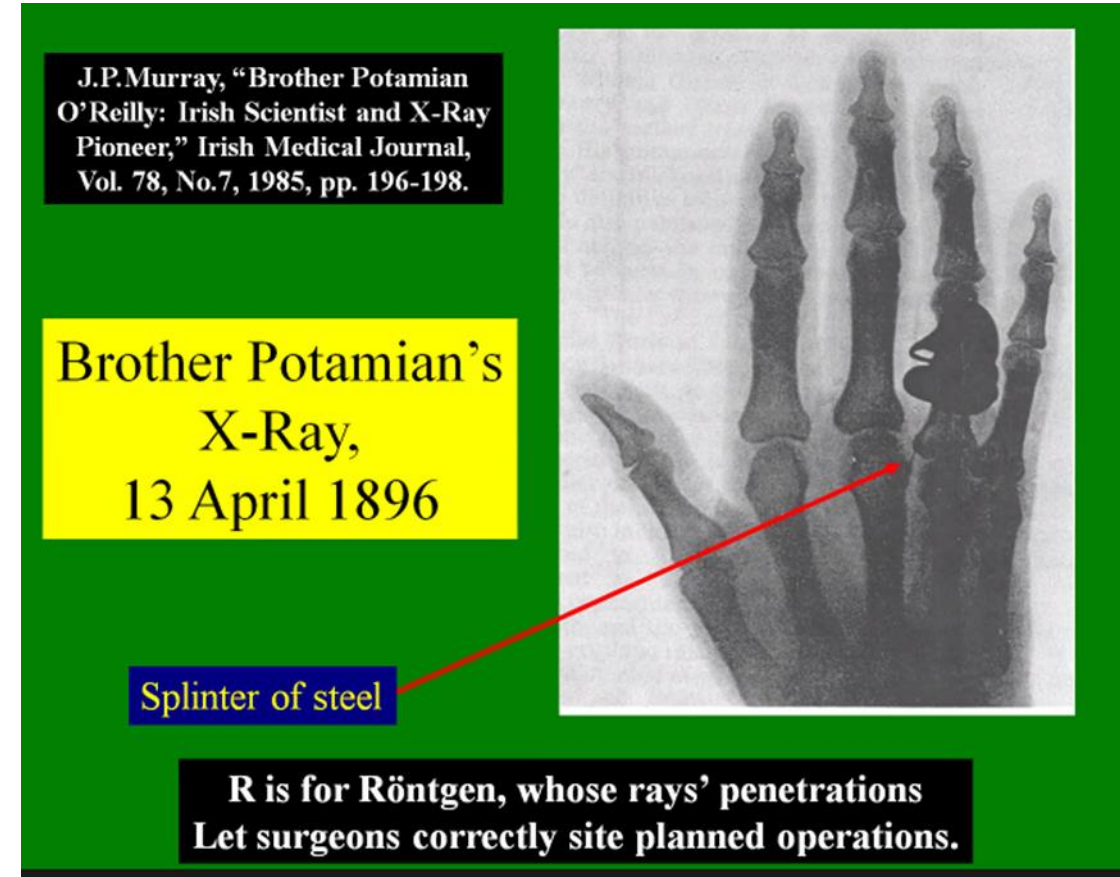
He gained a PhD in 1883 in London

He researched on Electricity for a decade

In 1893 Bro. Potamian was appointed Professor of Physics at "Teacher Training College" in Waterford

He took his famous x-ray photo 4 months after Roentgen's discovery.

Even Later that year he was transferred to New York where he worked until he died in 1917.



Acknowledgement: Annraoi de Paor. (UCD)

William Parsons (1800 – 1867)

3rd Earl of Rosse

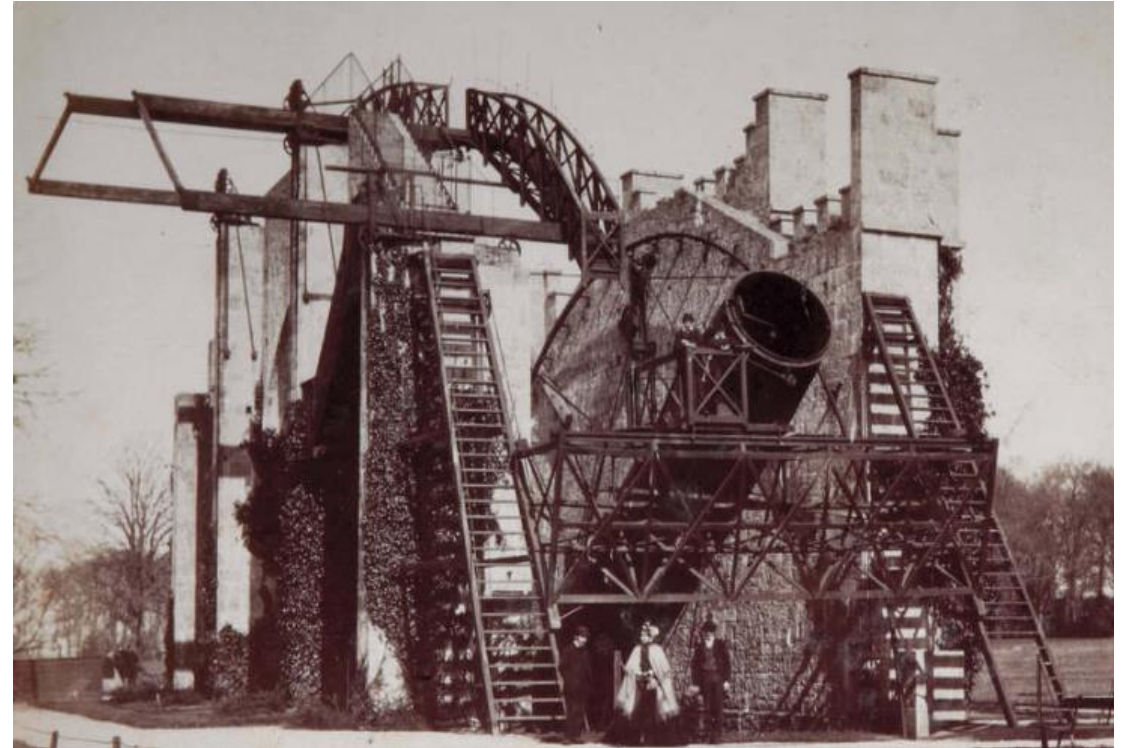
William Parsons was born in York, England

He was educated at Trinity College Dublin and Oxford University

In 1845 he constructed a giant reflecting telescope at Birr Castle. It had a 72-inch speculum metal mirror.

The telescope known as the “Leviathan” was the largest telescope in the world for 72 years

It enabled Parsons to identify the spiral nature of the Whirlpool galaxy.



John Holland (1841 – 1914) - submarine

John Holland was born in Liscannor, Co. Clare.

His father was a coast guard

John became a Christian Brother and taught maths and physics

Emigrated to USA in 1873

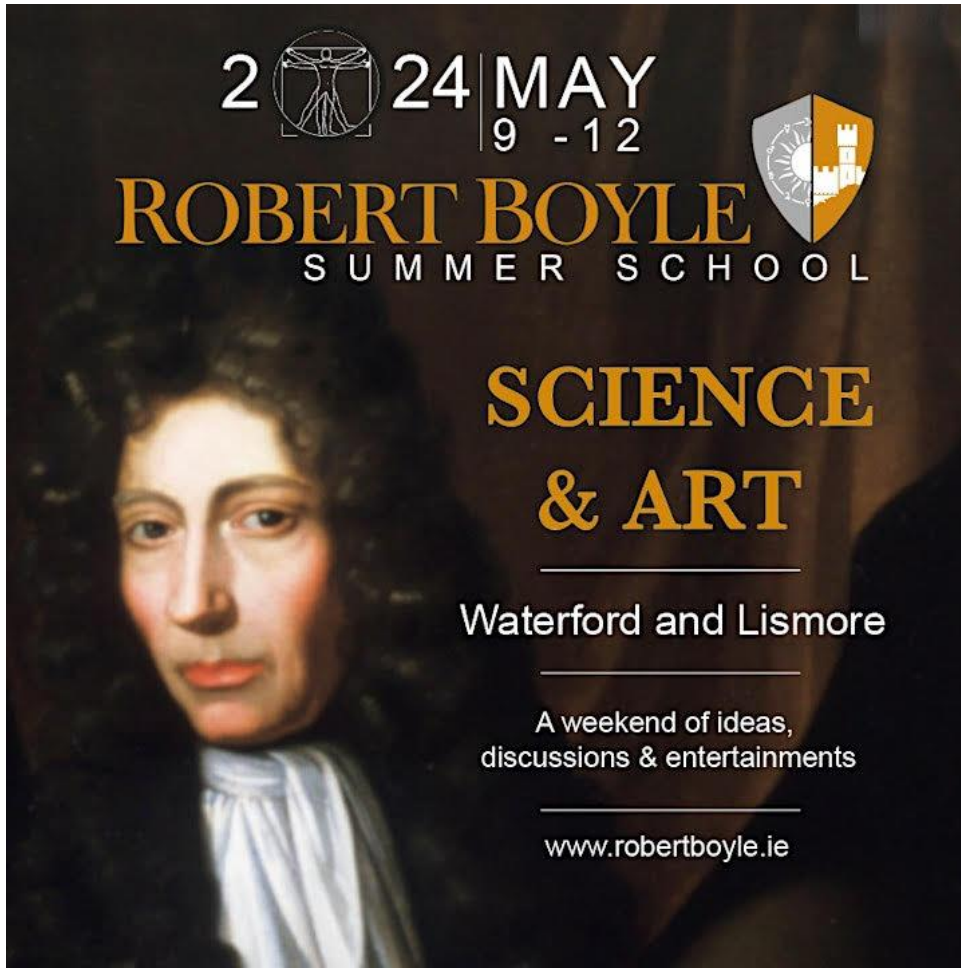
Designed and patented the first petrol driven submarine

Kathleen Lonsdale

Kathleen Lonsdale (X-ray crystallographer)

<https://www.ria.ie/news/dictionary-irish-biography/kathleen-lonsdale-dib>

Upcoming events



Booking and further information at:
<https://www.robertboyle.ie/robert-boyle-summer-school/>

The next IOP Physics Hub

Next IOP Physics Hub will be on 25 April 2024

Booking at:

<https://www.smartsurvey.co.uk/s/HZGHX0/>

or

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

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

[IOP Physics Hub padlet](#)

IOP Physics Hub

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

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