

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

Theme **Spectra**

David Keenahan IOP Physics Coach

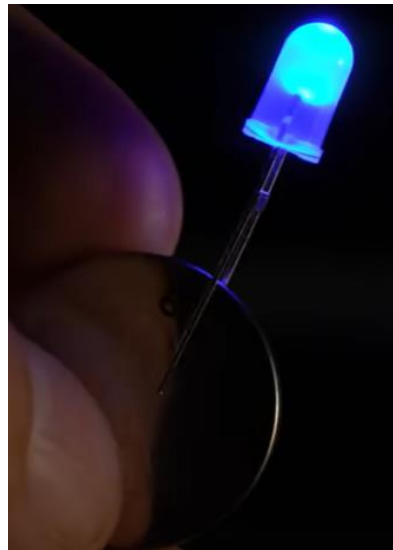
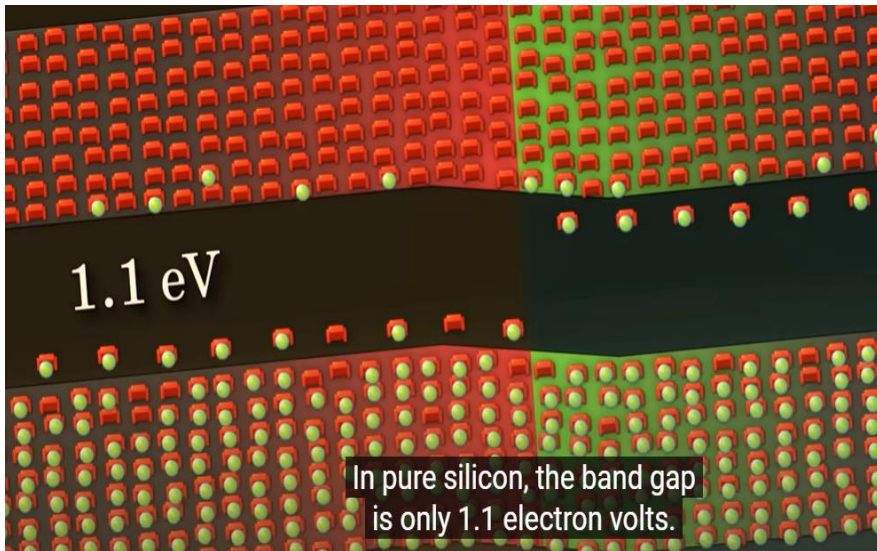
Paul Nugent IOP Physics Coach

upcoming events

Michael Grehan introduced the film entitled:

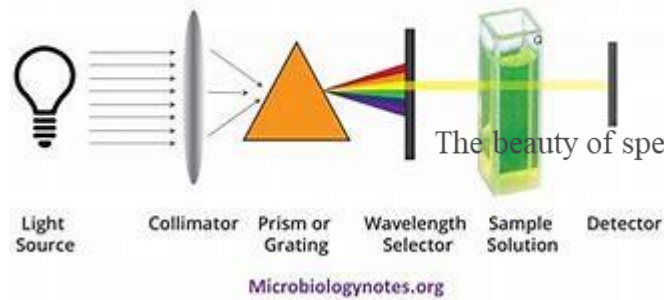
Why it was almost impossible to make a blue LED.

The film was narrated by Derek Muller of Veritasium,
and is available to view from YouTube at <https://www.youtube.com/watch?v=AF8d72mA41M>
It told the story of Nakamura the Japanese engineer who developed the blue LED

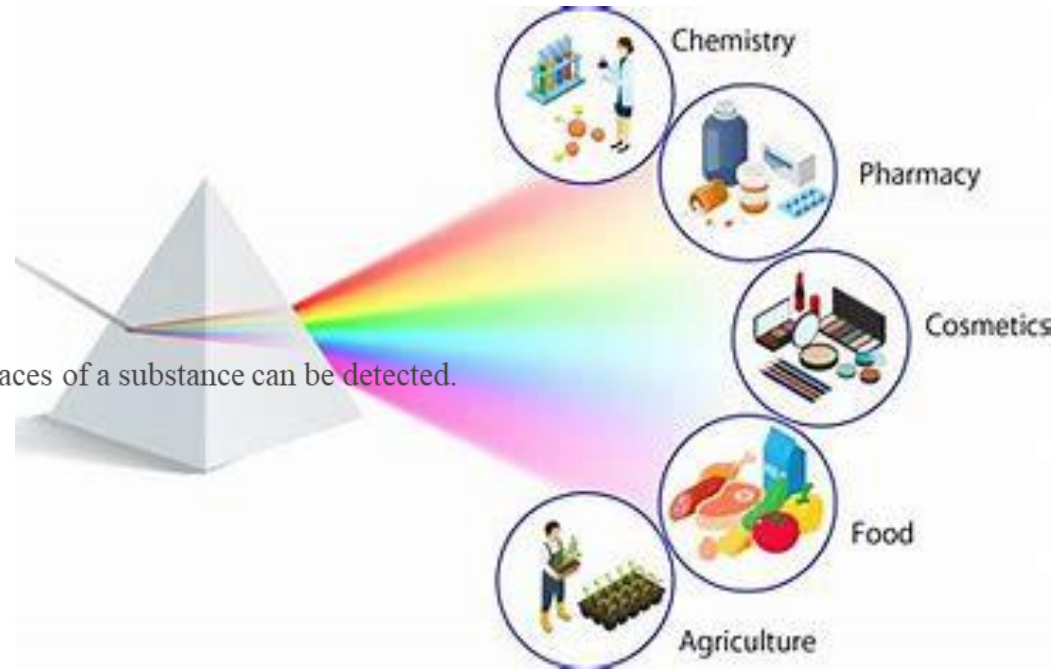


Overview

Spectroscopy: Introduction, Principles, Types and Applications

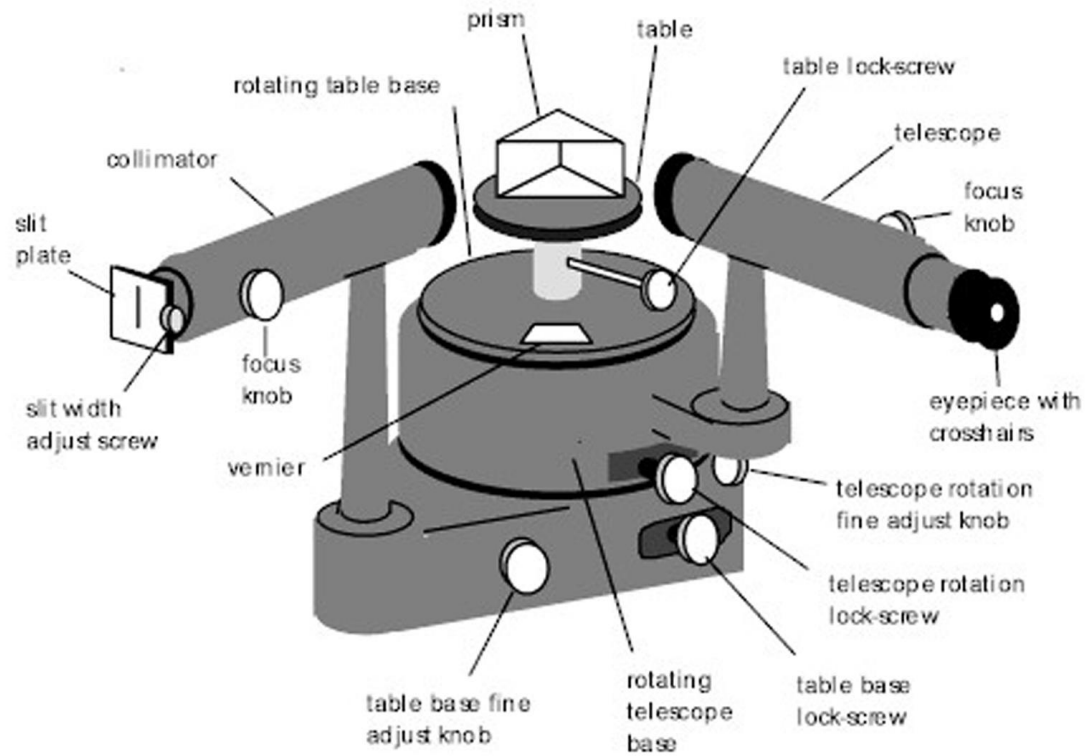


The beauty of spectroscopy is that tiny traces of a substance can be detected.



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Spectrometer

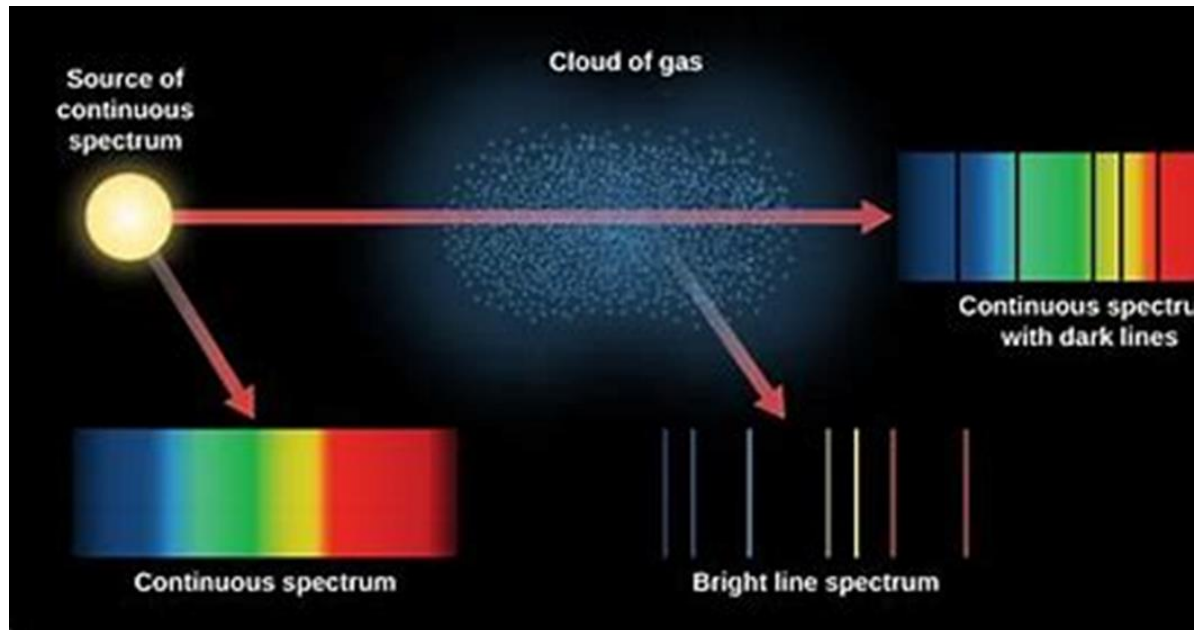
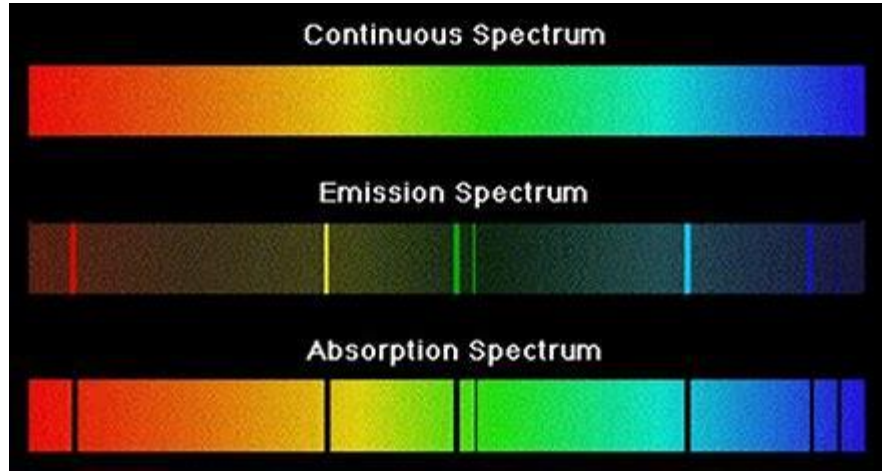


www.abronexports.com

Adjust a spectrometer (video)

<https://www.youtube.com/watch?v=h4RicZDeLQY>

Types of spectra



H and He

Hydrogen



Helium



Examples of emission spectra

Hydrogen:



Helium:



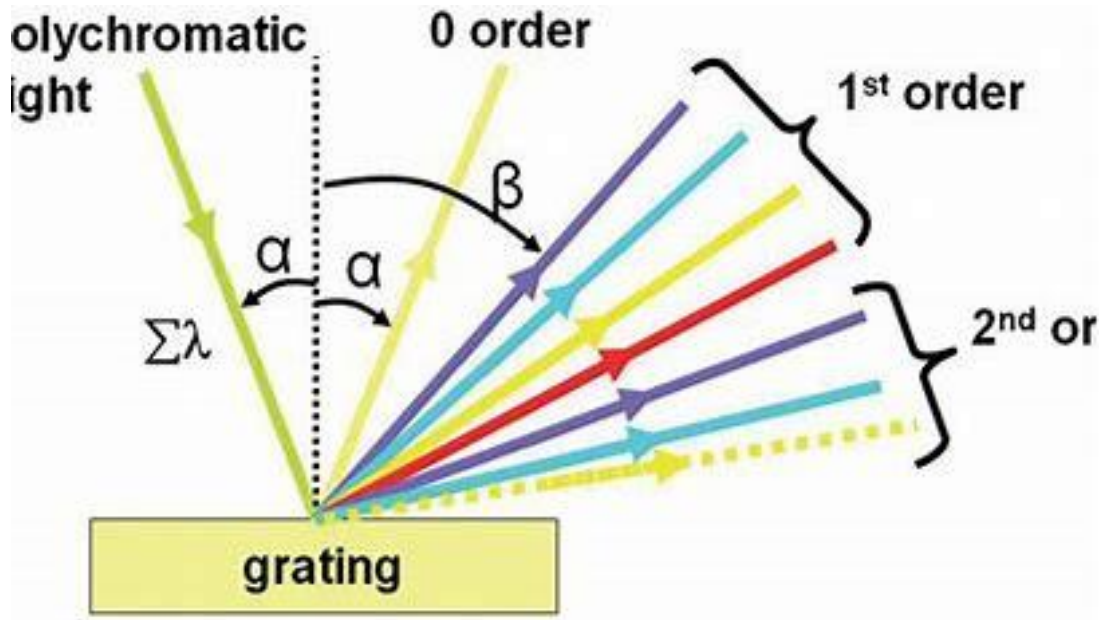
Carbon:



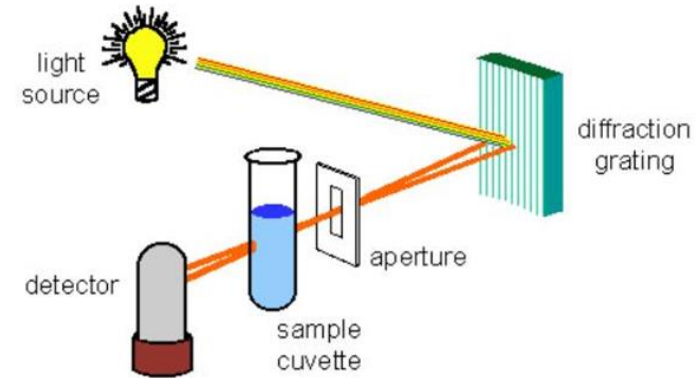
Equipment



Reflective diffraction grating

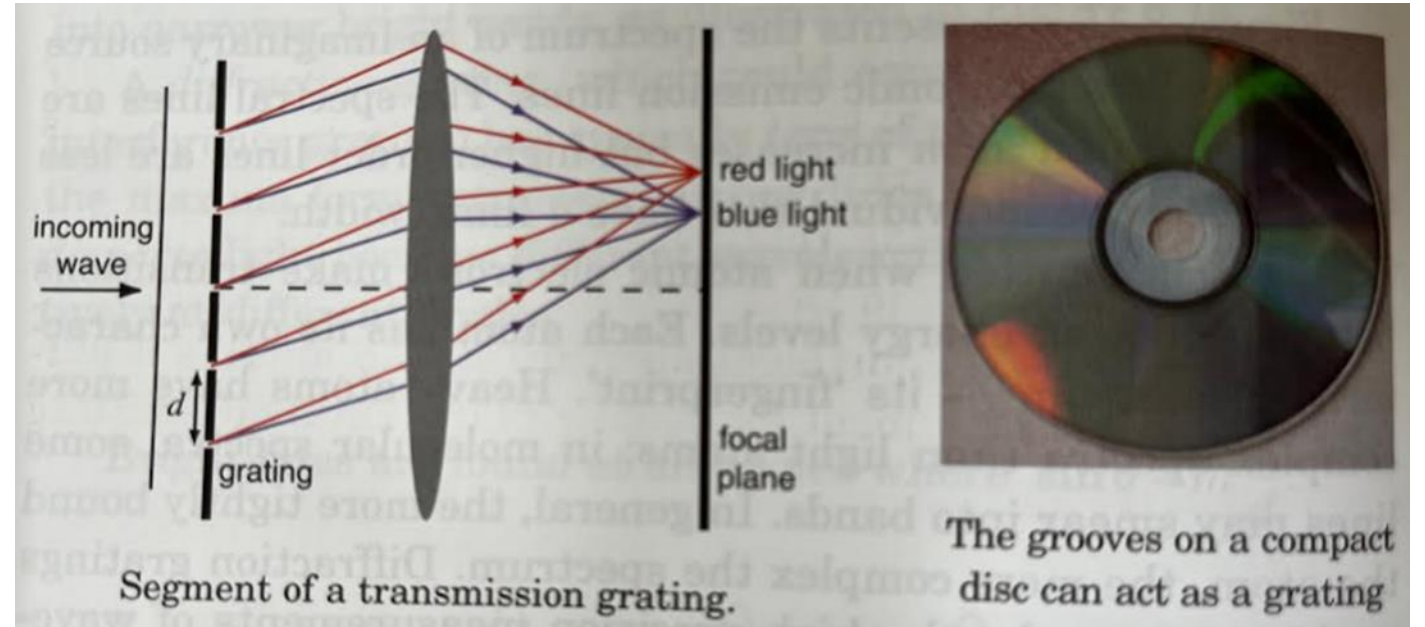
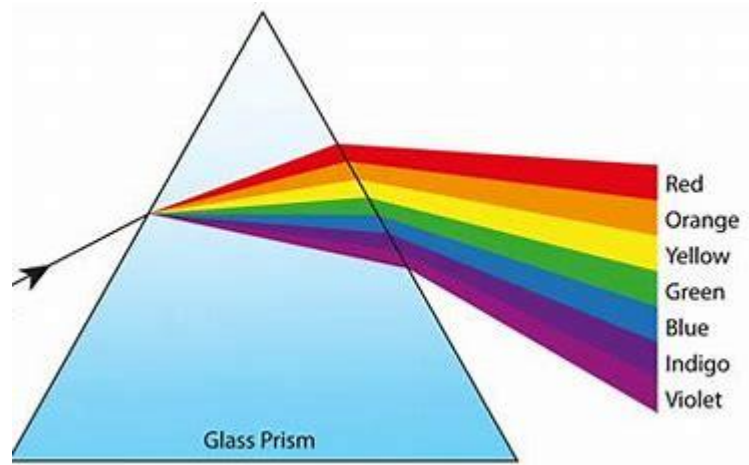


ULTRAVIOLET-VISIBLE SPECTROSCOPY



Schematic of a wavelength-selectable, single-beam UV-Vis spectrophotometer

Dispersal methods have evolved



In 1890s diffraction gratings began to replace prisms in spectroscopy.
In the 1960s reflective diffraction gratings emerged as an alternative to transmission gratings.

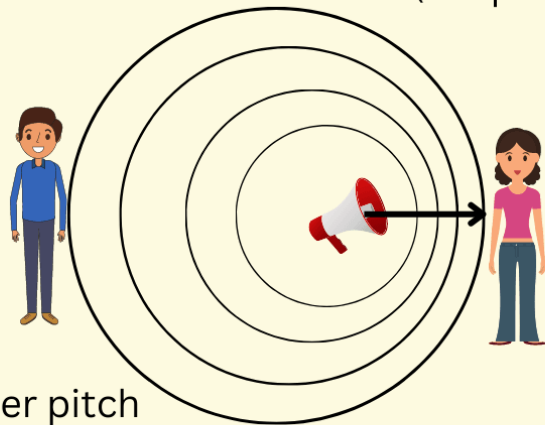
Red shift provides evidence of expanding universe

Doppler Effect

The Doppler effect is the shift in the frequency of a wave in relation to an observer due to relative motion of the wave source and observer.

SOUND

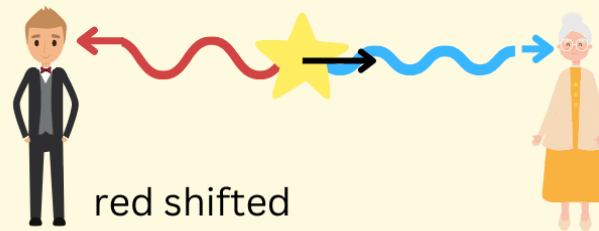
higher pitch
(frequency)



lower pitch
(frequency)

LIGHT

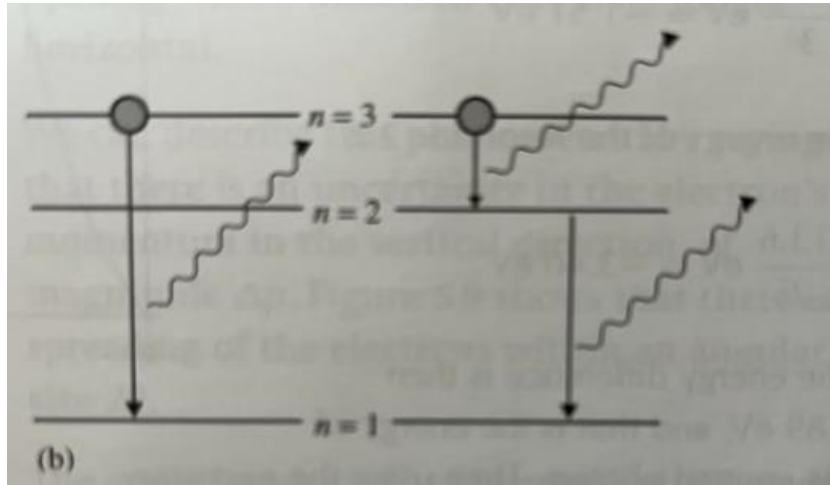
blue shifted



red shifted

sciencenotes.org

Bohr model of atom aligns with spectroscopy

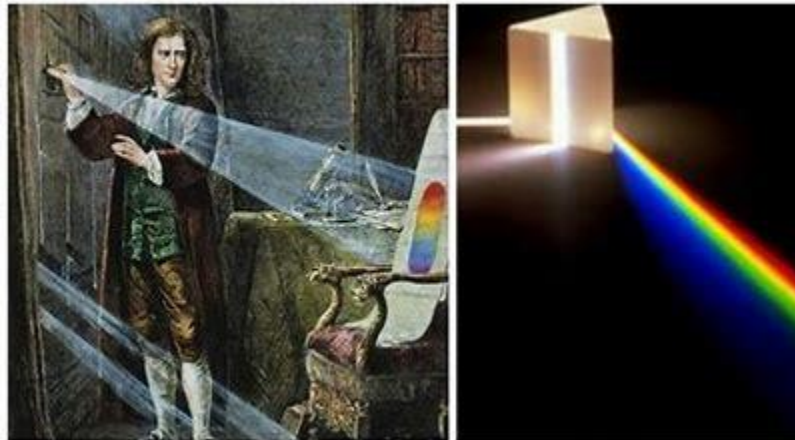


(b) The energy level diagram for the hydrogen atom
One photon is emitted for each transition from a high to a lower energy level

Newton

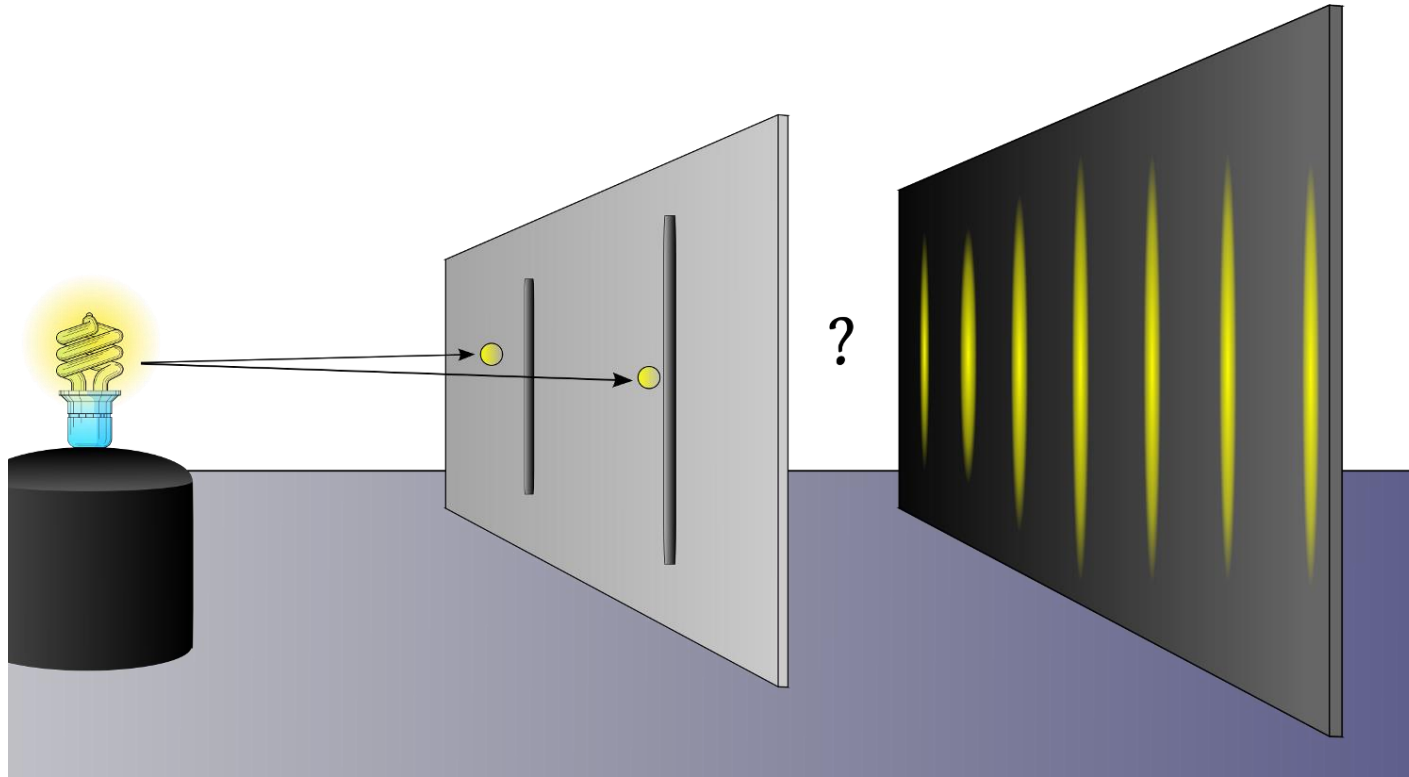


Isaac Newton
1666

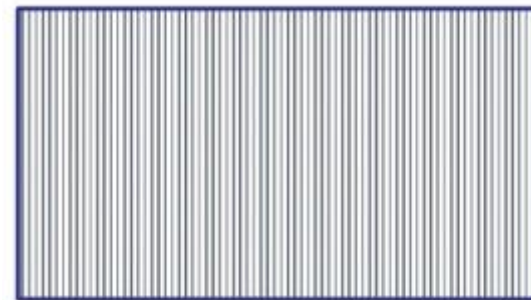
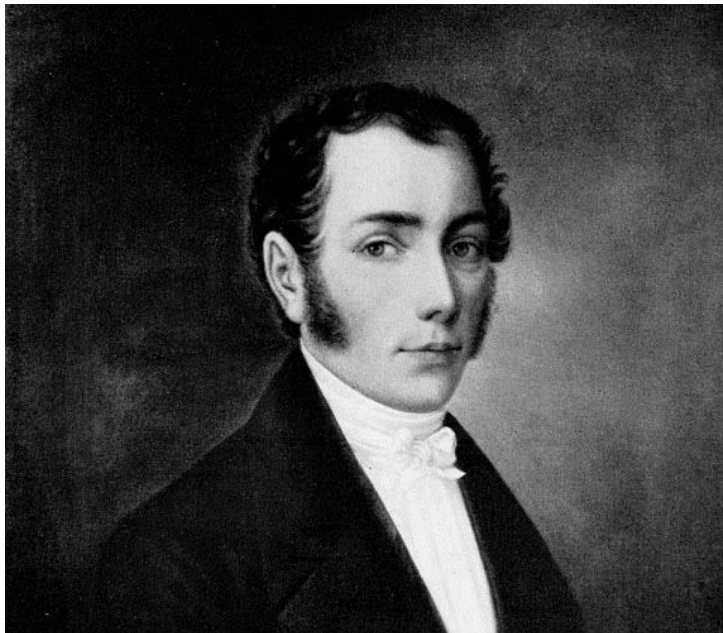
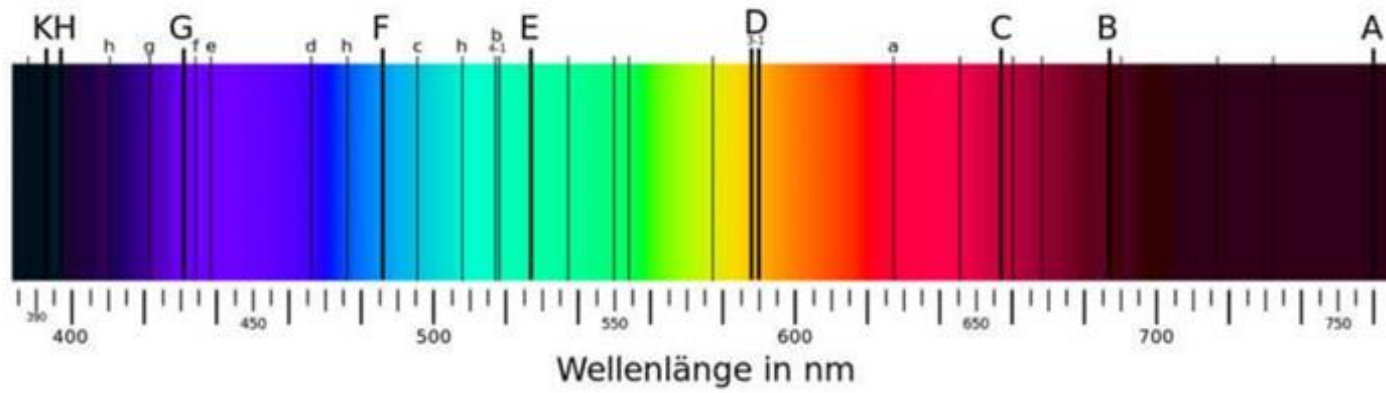


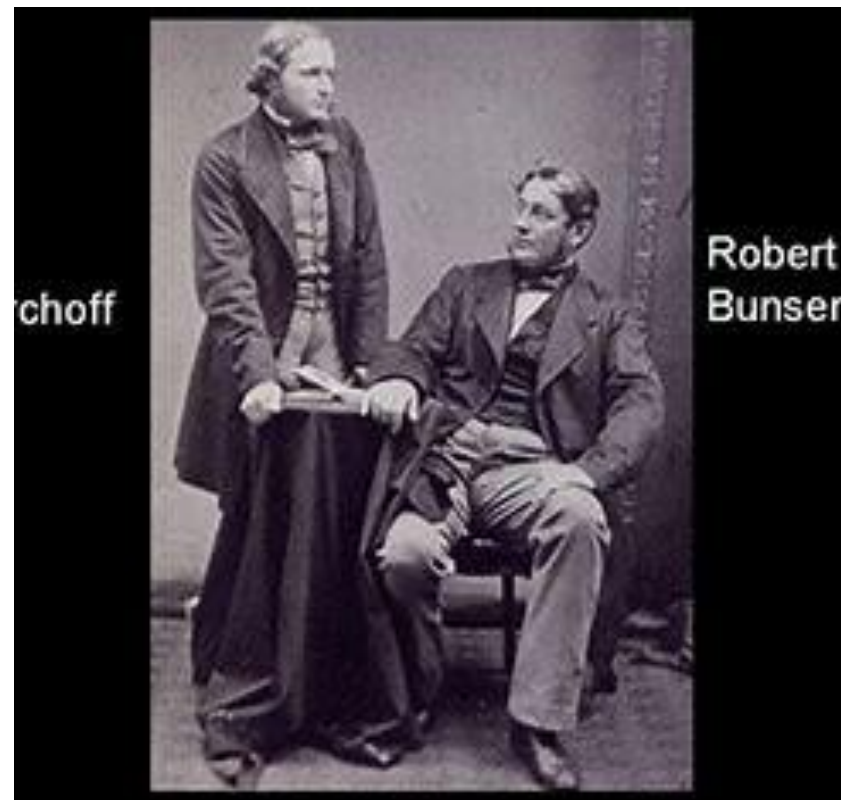
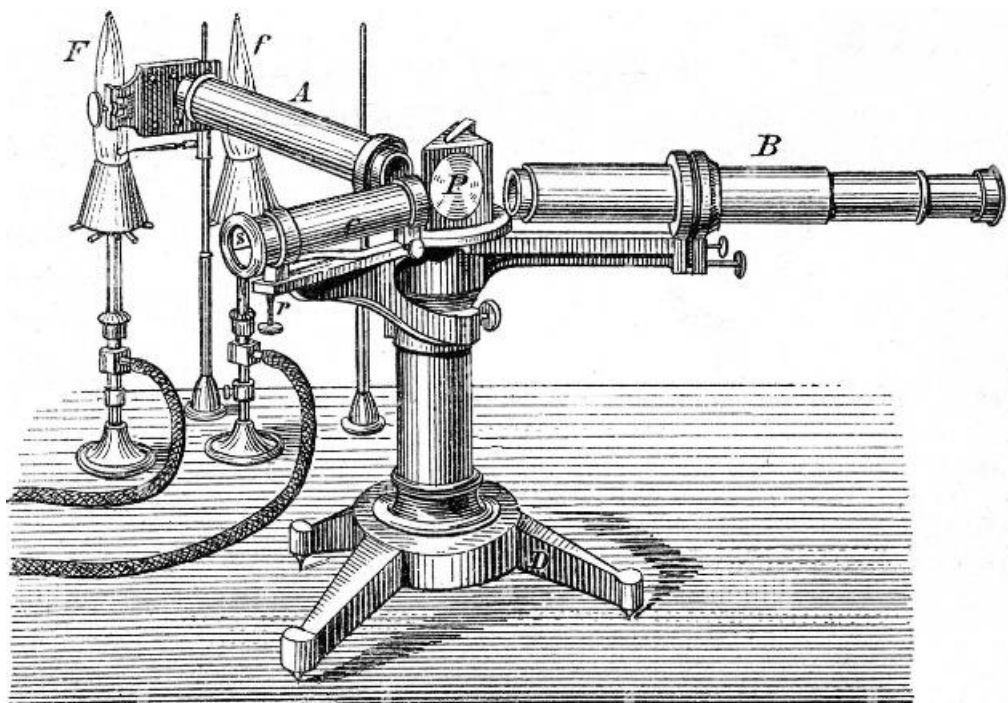
Young's double slit experiment

1800 Young's famous double slit experiment



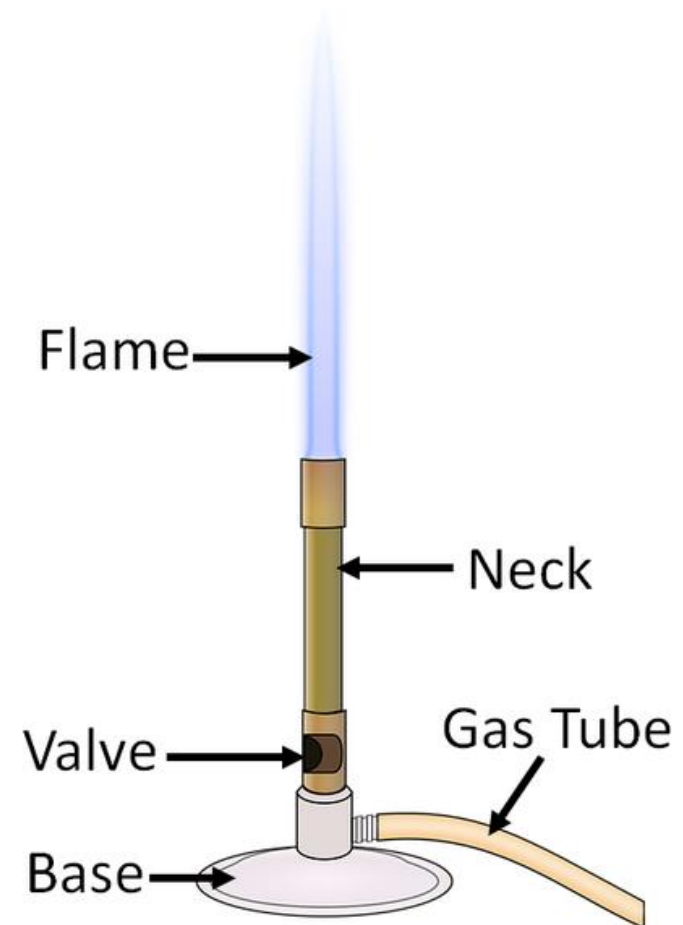
Fraunhofer



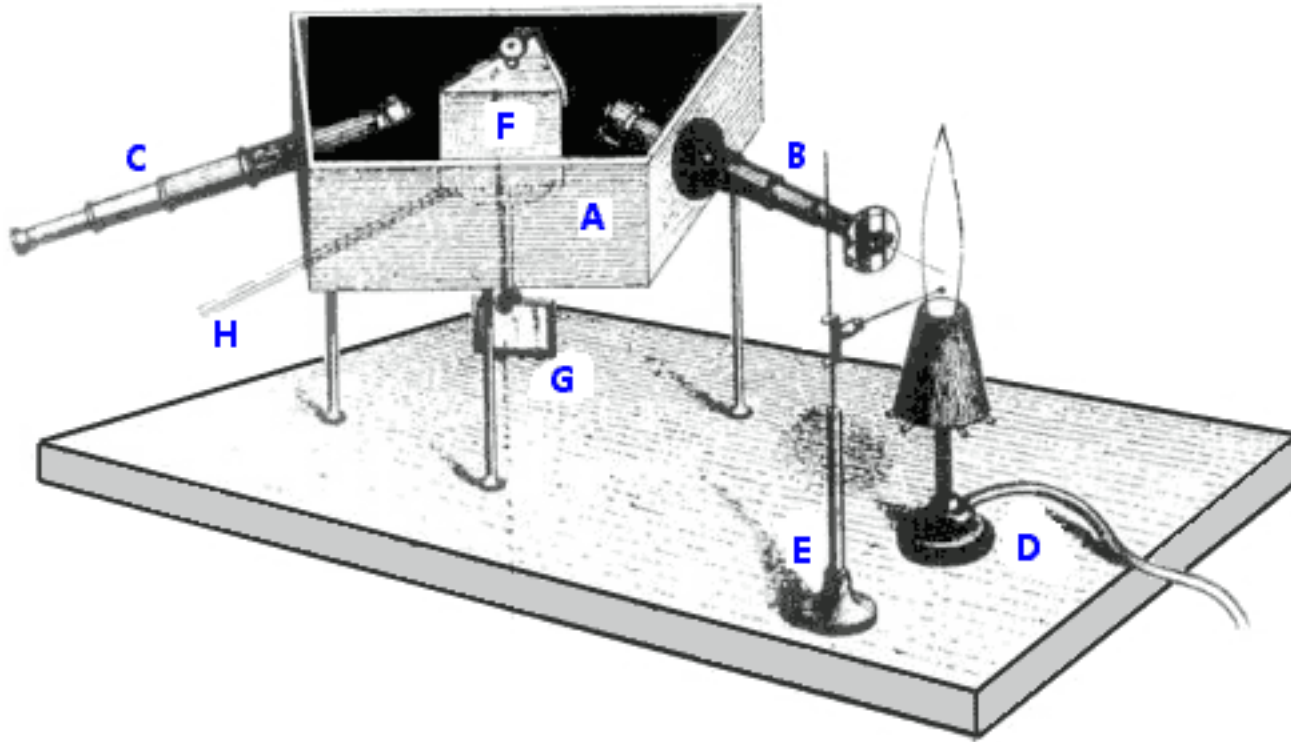


Bunsen burner

Robert Bunsen



Bunsen-Kirchoff spectroscope with Bunsen burner



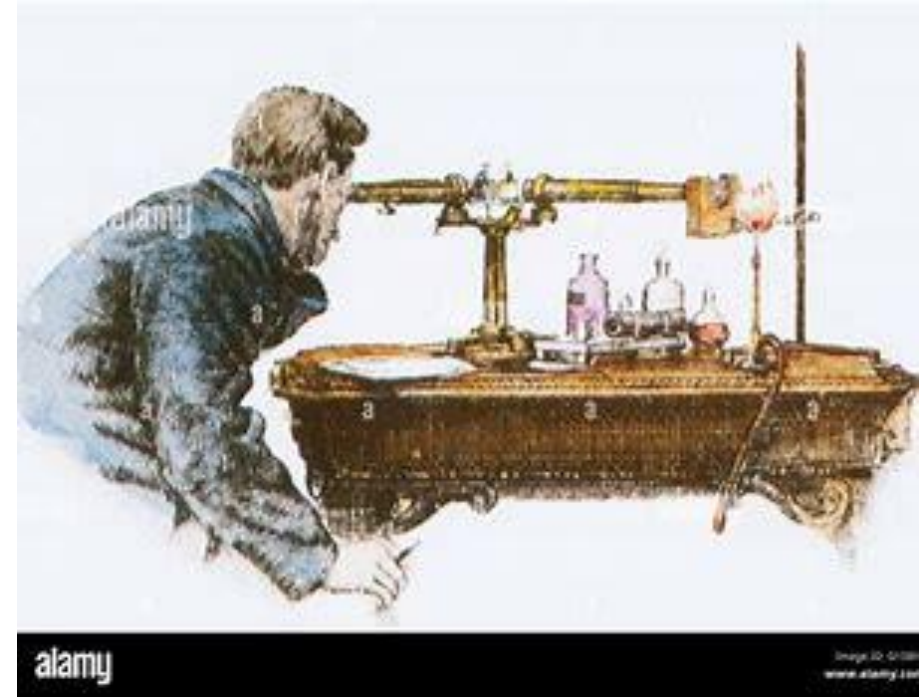
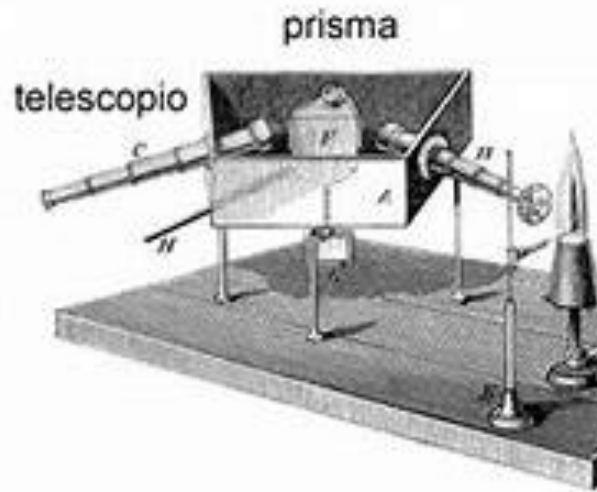
KEY: (A) Box, colored black on the inside;
(B) & (C) Telescopes; (D) Bunsen Burner; (E) Sample Holder; (F) Prism;
(G) Mirror; (H) Handle to rotate prism and mirror.

Bunsen & Kirchhoff

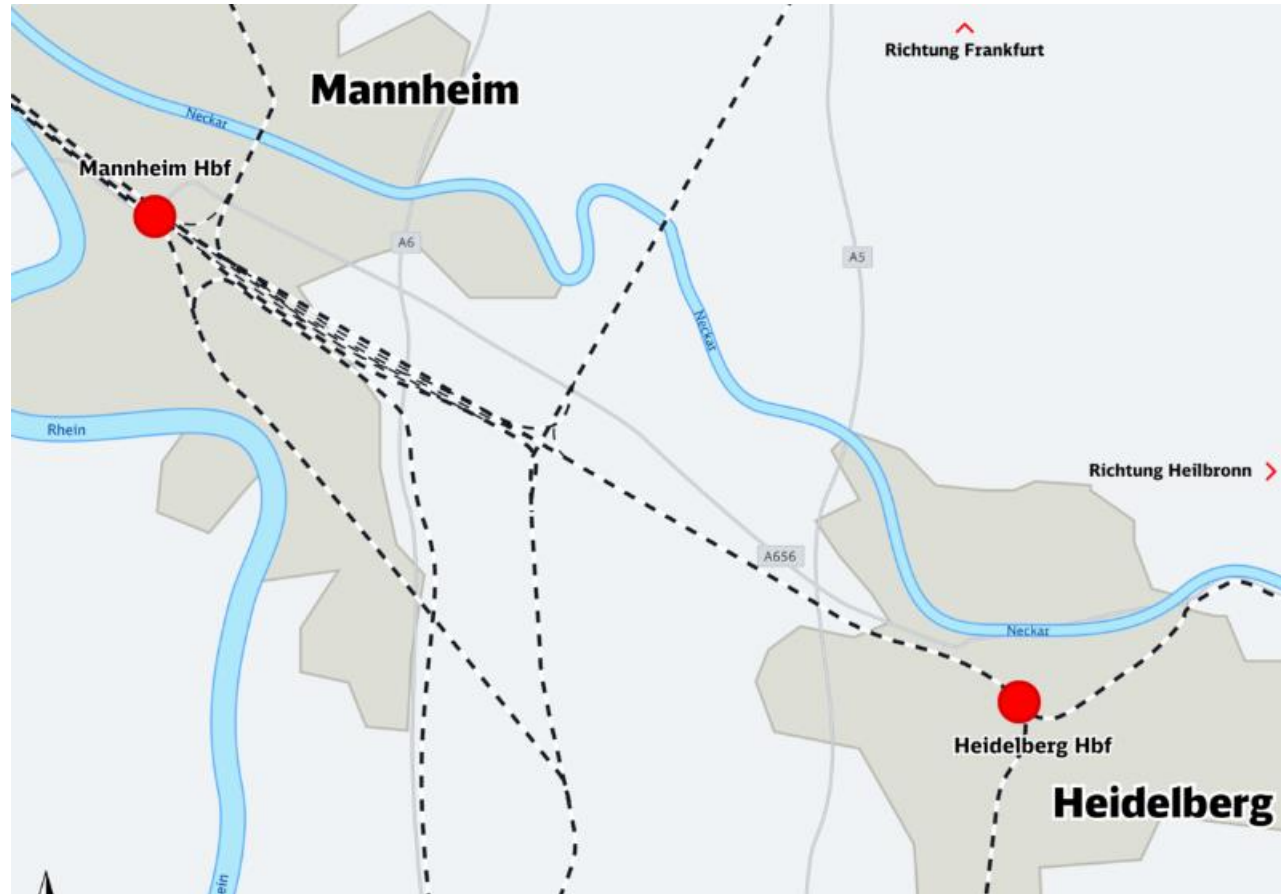


Gustav
Kirchhoff

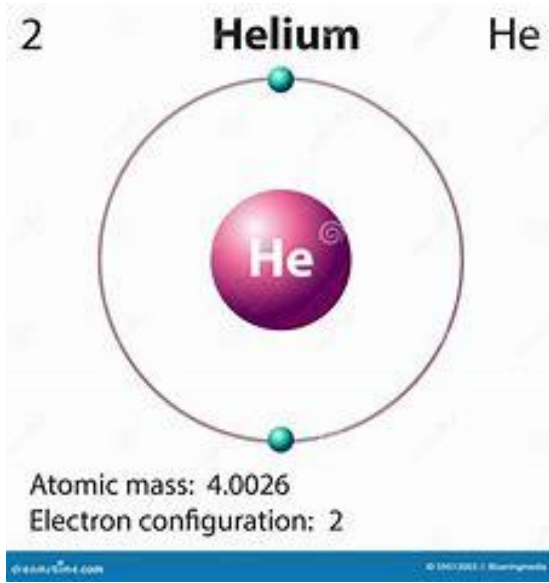
Robert
Bunsen



Bunsen and Kirchhoff observed a fire in Mannheim using a spectroscope



Helium



The Balmer formula for Hydrogen atom

$$\frac{1}{\lambda} = R_{\text{H}} \left(\frac{1}{1^2} - \frac{1}{n^2} \right)$$

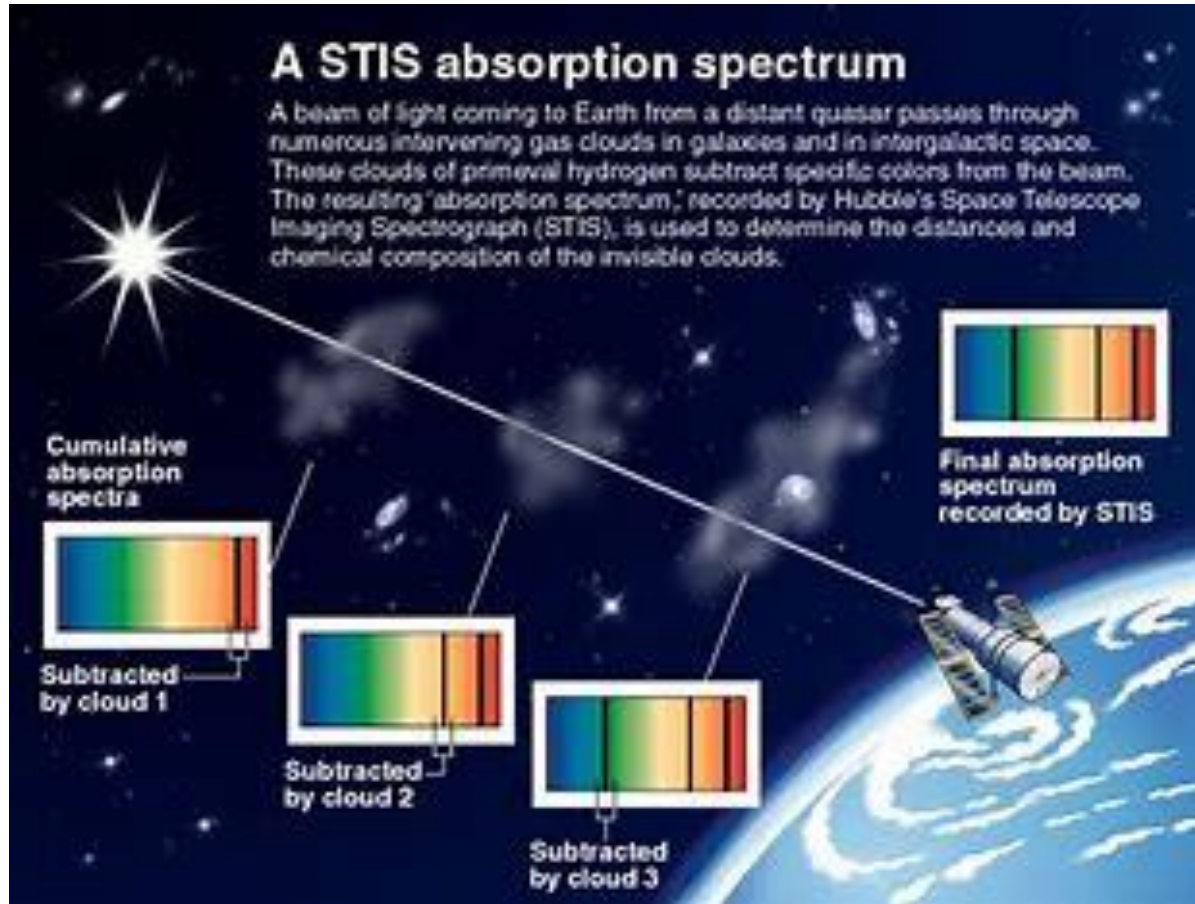
Where R is the Rydberg constant

The wavelength of the red line at 656 nm corresponds to $n = 3$ and the wavelengths of the remaining (blue) lines correspond to $n = 4, 5,$ and 6

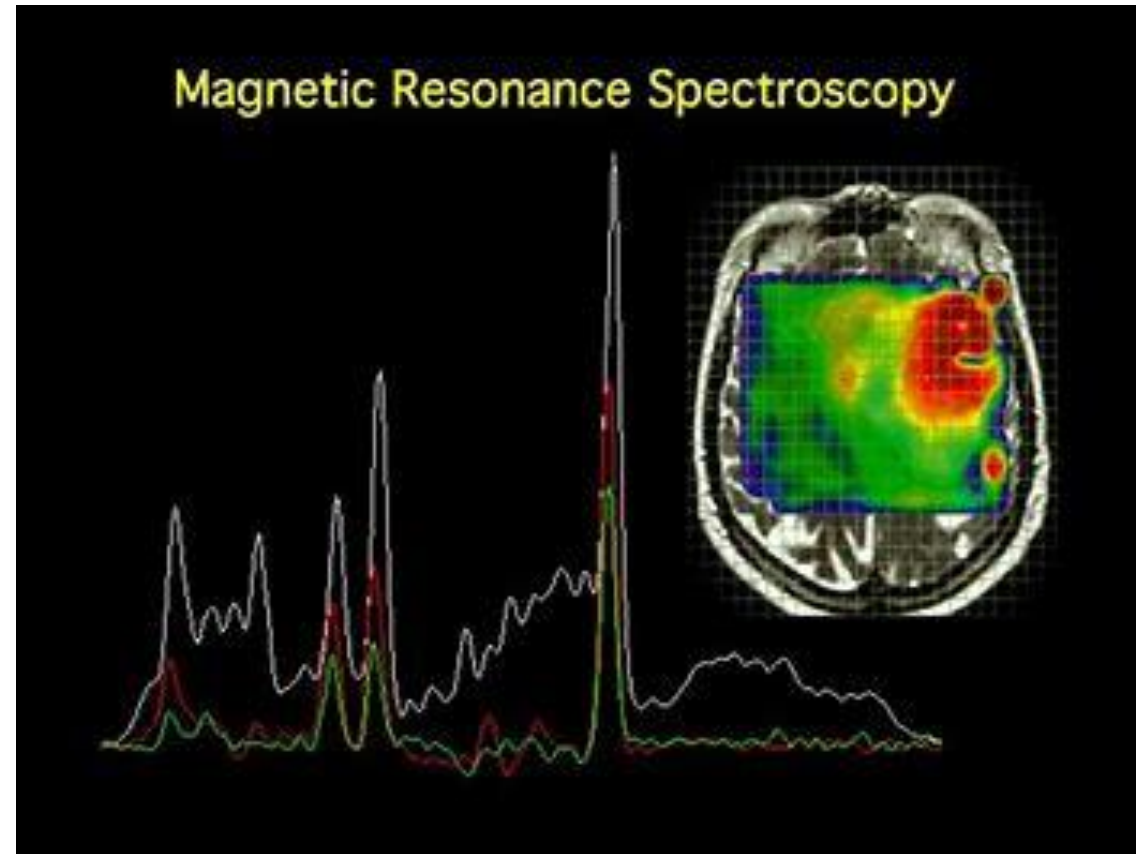
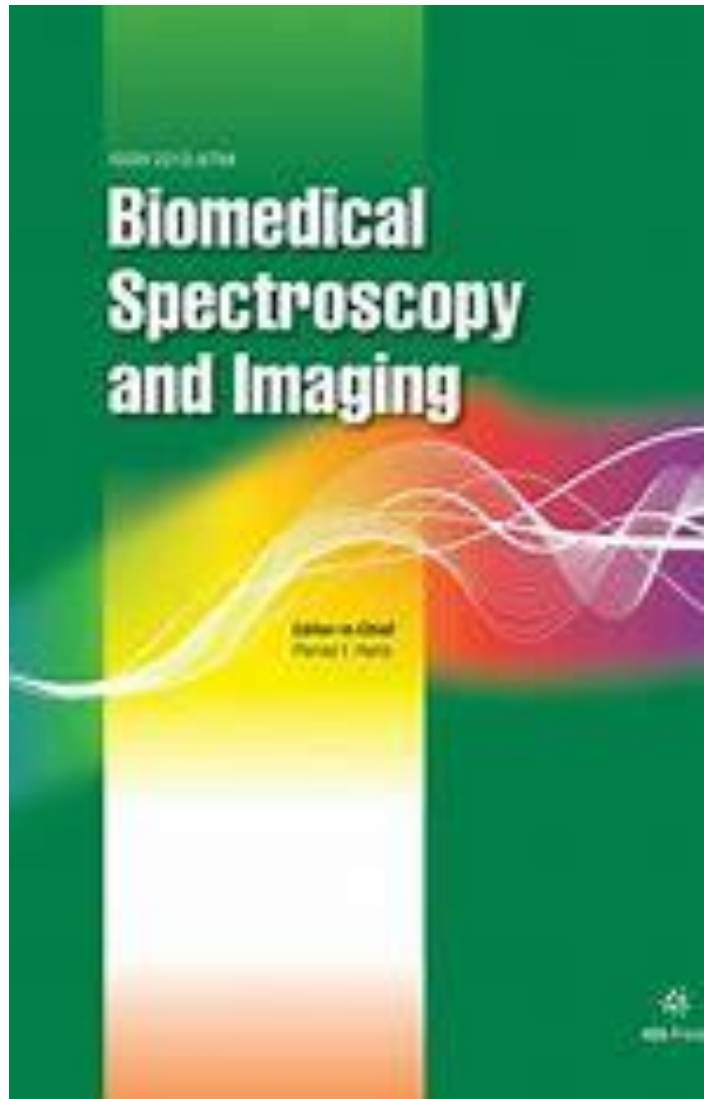
The Bohr model of the atom explains the Balmer formula for the spectral lines of hydrogen.

The light energy is the difference in energies between the two orbits in the Bohr formula.

Spectroscopy and astrophysics



Spectroscopy in medicine



Upcoming events

IOP Spring Conference, 6 April 2024 Dublin



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

Ireland Spring Conference 2024

Featuring:
the Rosse Medal competition, showcasing postgraduate research,
and invited talks, networking opportunities and an evening dinner.

6 April 2024

Royal College of Surgeons, Dublin, Ireland



Oide LC Physics Lab Days



Oide

Tacú leis an bhFoghlaim
Ghairmiúil i measc Ceannairí
Scoile agus Múinteoirí

Supporting the Professional
Learning of School Leaders
and Teachers

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

ISTA Annual Conference



<https://bit.ly/ista2024>

Annual Conference 2024

Senior Cycle Reform -
Applications for Teaching, Learning and
Assessment of Leaving Certificate
Biology, Chemistry and Physics

March 1st and 2nd 2024
SETU Waterford Campus

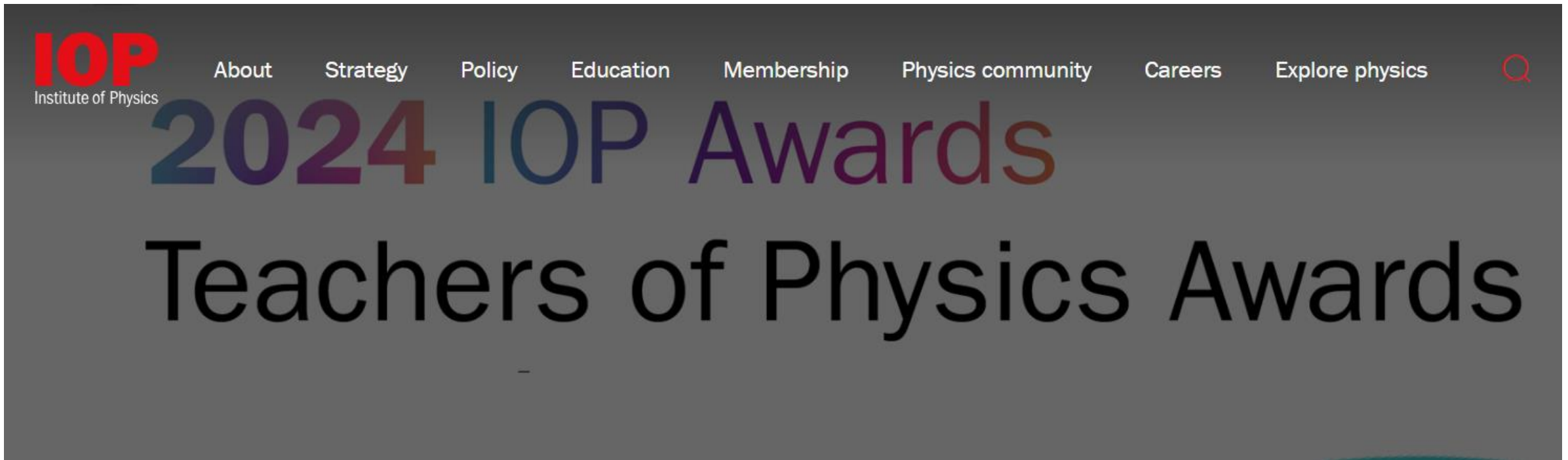
Details and booking
information at
www.ista.ie



- *Science education as a force for good* – Prof Luke O’Neill
- *The Science of Extreme Sport* – Dr Bruce Wardop
- *Decoding Biodiversity: Integrating DNA Analysis into Science Education Workshop?* – Dr Denise O Meara
- *Artificial Intelligence – implications for Teaching, Learning and Assessment* – Dr Keith Young
- The experience in implementing and assessing coursework in the new Leaving Certificate Agricultural Science Specification – Joe Coroon Chairperson IASTA
- Reports and discussions on new Leaving Certificate Biology, Chemistry and Physics specifications.
- Workshops from:
Oide, Science on Stage, Royal Society of Chemistry, SFI and much more....

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 7 March

Booking at:

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

or

<https://www.smartsurvey.co.uk/s/SZ4YAM/>

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

IOP Physics Hub

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

IOP Institute of Physics