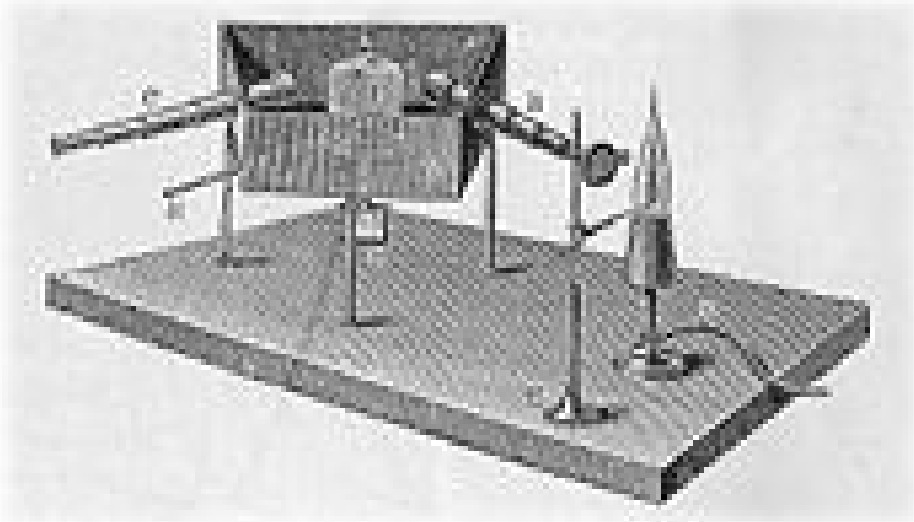


The mid 1800's and a
HUGE discovery.

Robert Bunsen



Co-inventor of the Spectroscope

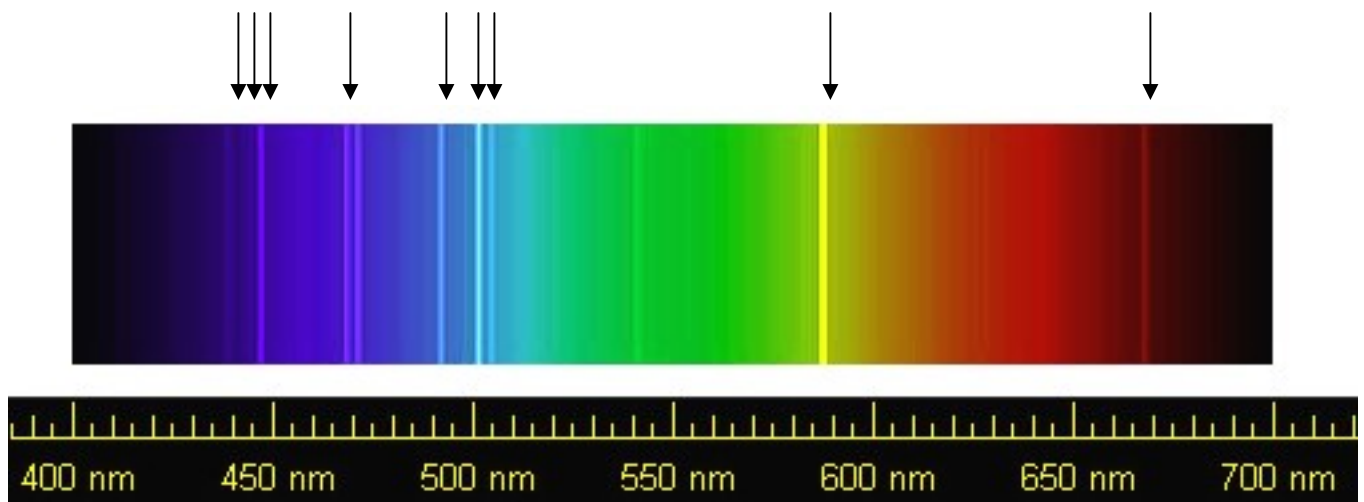


Above: Bunsen & Kirchhoff's first spectroscope
device

The spectroscope allows us to see an **EMISSION SPECTRUM** of the light given off by a luminous object or material.

Bunsen & Kirchhoff found that **each element has its own unique emission spectrum** also known as a set of spectral lines.

Shown below is the emission spectrum of **helium**.



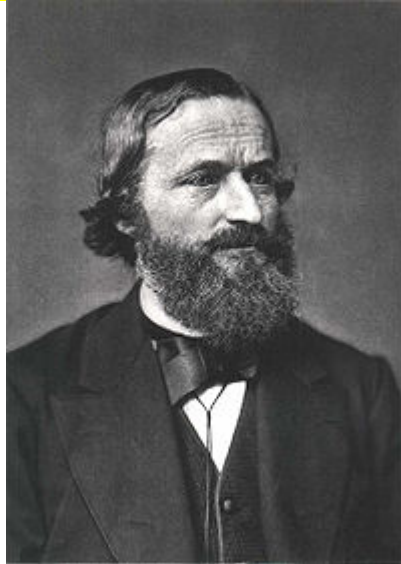
[Link to other selected elements](#)

Bunsen investigated emission spectra of heated elements, and with Gustav Kirchhoff he discovered the elements **cesium** (in 1860) and **rubidium** (in 1861).

With his laboratory assistant, Peter Desaga, he developed the **Bunsen burner**, an improvement on the laboratory burners then in use.

The Bunsen-Kirchhoff Award for spectroscopy is named after Bunsen and his colleague, Gustav Kirchhoff.

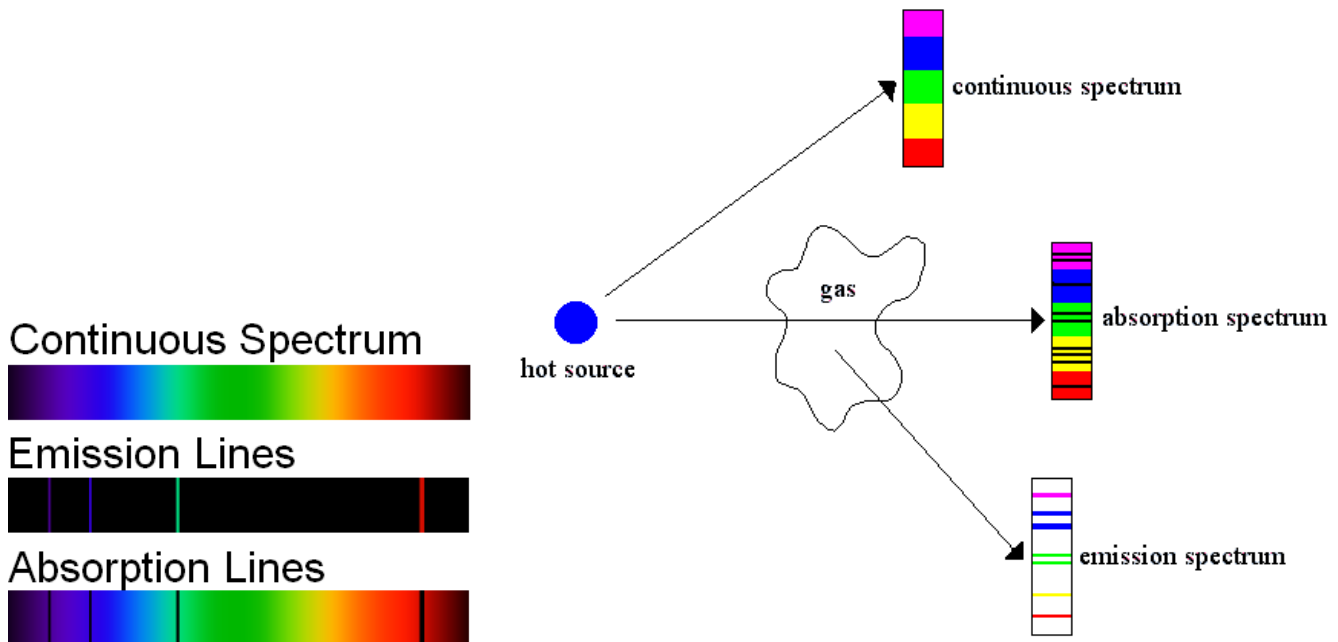
Gustav Robert Kirchhoff



German physicist who contributed to the fundamental understanding of electrical circuits, spectroscopy, and the emission of black-body radiation by heated objects. He coined the term "black body" radiation in 1862, and two sets of independent concepts in both circuit theory and thermal emission are named "Kirchhoff's laws" after him.

Kirchhoff's three laws of spectroscopy

1. A hot solid object produces light with a continuous spectrum.
2. A hot tenuous gas produces light with spectral lines at discrete wavelengths (emission spectrum).
3. A hot solid object surrounded by a cool tenuous gas (i.e. cooler than the hot object) produces light with an almost continuous spectrum which has gaps at discrete wavelengths. (aka: absorption spectrum)



The spectra above depend on the energy levels, numbers and positions of the electrons in the elements of the hot material.

But, no one knew about the existence of energy levels in atoms yet ...

The existence of discrete spectral lines was later explained by the Bohr model of the atom, which helped lead to quantum mechanics.
