

# Experimental observation of hydrogen atom emission

- Hydrogen atom emission is “quantized”. It occurs at discrete wavelengths (and therefore at discrete energies).
- The Balmer series results from four visible lines at 410 nm, 434 nm, 496 nm and 656 nm.
- The relationship between these lines was shown to follow the Rydberg relation.



# Rydberg equation

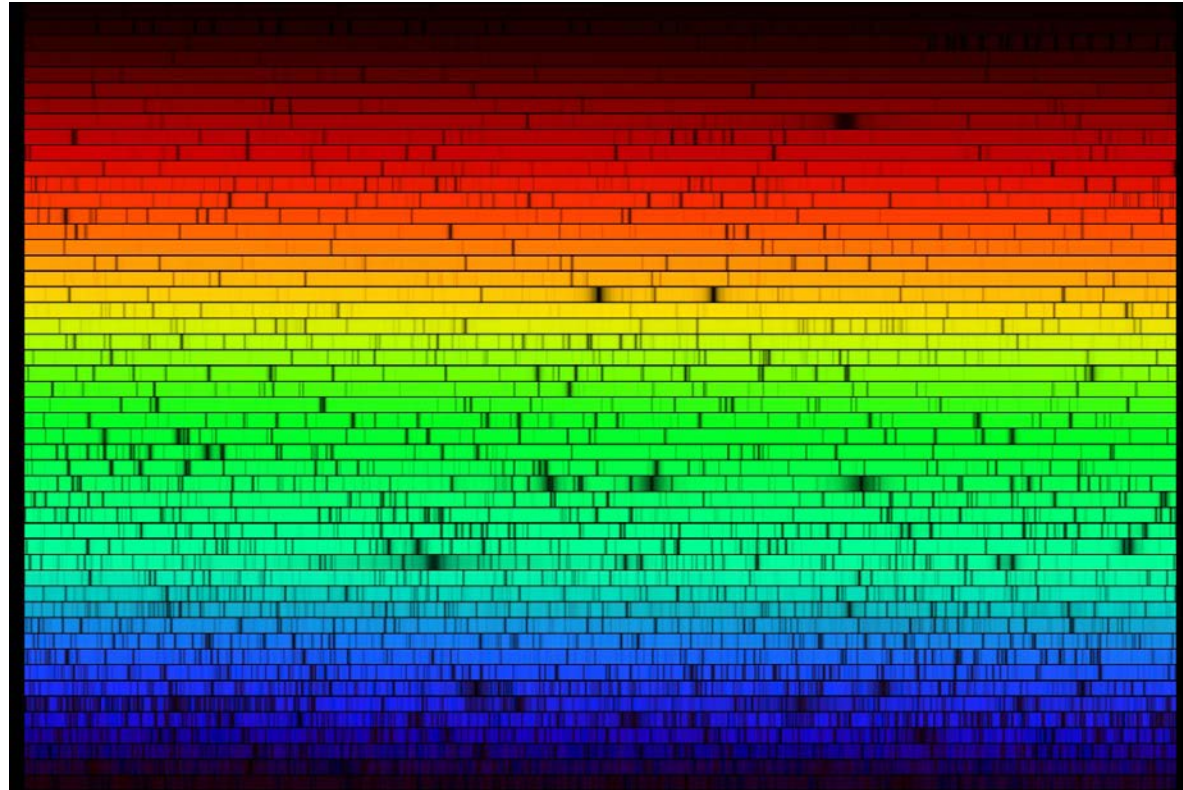
- Atomic spectra consist of series of narrow lines.
- Empirically it has been shown that the wavenumber of the spectral lines can be fit by

$$\tilde{\nu} = \frac{10^7}{\lambda} = \tilde{R} \left( \frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

where R is the Rydberg constant, and  $n_1$  and  $n_2$  are integers.

Note that  $n_2 > n_1$ .

# Solar spectral evidence for quantum transitions



- There are gaps in the solar emission called Fraunhofer lines.
- The gaps arise from specific atoms in the sun that absorb radiation.

# Absorption by gases in the atmosphere

