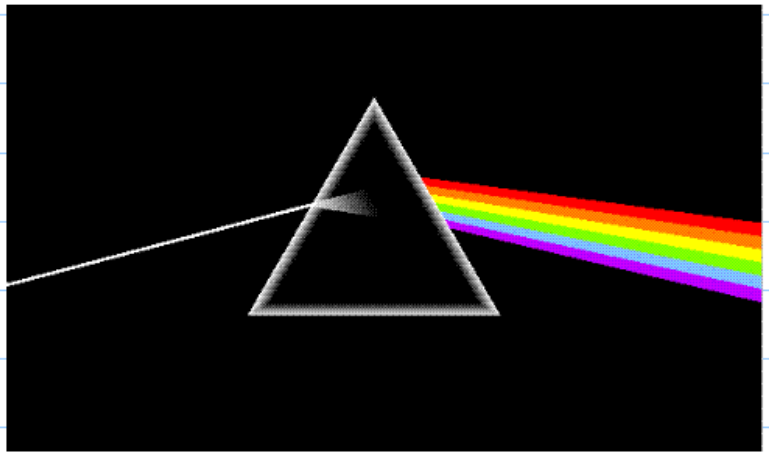
# PHY100S - The Magic of Physics - Class 19

From Pink Floyd, "Dark Side of the Moon"



"The phenomenon of the colours."
-- Newton

# §13.6 Interpretations

Quantum Theory:

wave function
state vector
psi-field
$\Psi$ "psi"

Born (1926):

wave of ~~probability~~ chance

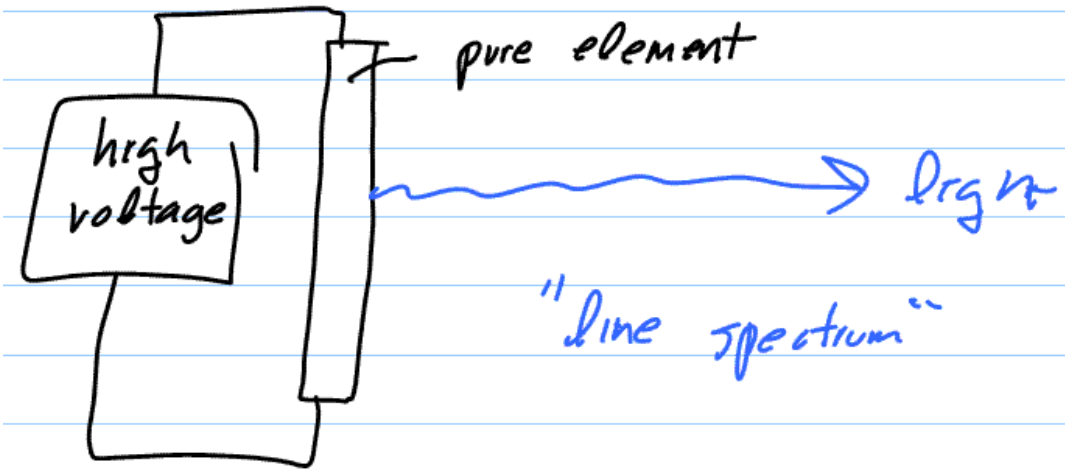
when we look "collapse $\Psi$"

Heisenberg: $\Psi$ "partly a fact, partly our knowledge of the fact."

# 19th century

Sunlight ⇒ prism ⇒

continuous spectrum




"line spectrum"

Hydrogen spectrum: regularity?

Balmer (1885) numerology

$$\text{wavelength} = R\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$$

R: constant

$n = 3, 4, 5, 6, 7$

$n = 8$? not visible but there

$$\text{wavelength} = R\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$$

$n = 2, 3, 4, \ldots$

not visible, but there

$$\text{wavelength} = R\left(\frac{1}{3^2} - \frac{1}{n^2}\right)$$

$n = 4, 5, 6, \ldots$

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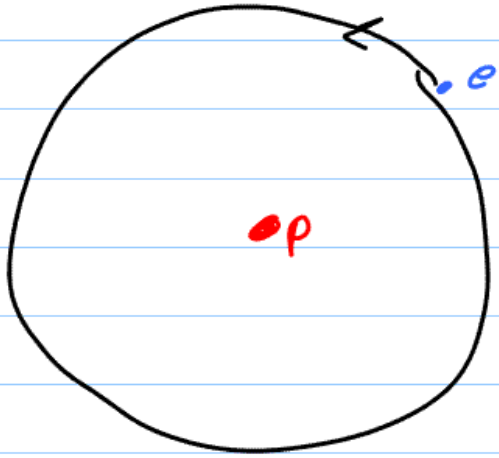
## Bohr (1913):

### Model




"Allowed orbits"

- characterised by an integer $n$
  $n = 1, 2, 3, \ldots$

- electron does not radiate.

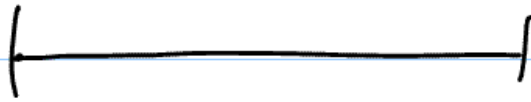
① electron absorbs photon, jumps to a higher energy state, higher value of n

② electron in a higher energy state, fall into lower state, emitting a photon

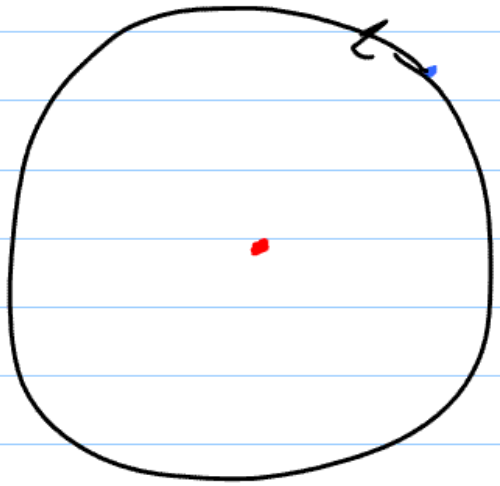
Ad hoc

§14.2 19th c topic

Standing Waves



string fixed at both ends



electron as a wave.

allowed orbits!

standing waves

↙

$n \times$ wavelength = circumference of circle

$n = 1, 2, 3, 4, \ldots$