DE BROGLIE'S WAVE THEORY

contents

Louis de Broglie

1924 PhD thesis on wave-particle duality

1929 Nobel Prize for Physics

Origins of the de Broglie Hypothesis

01 The introduction of photons in light waves.

02 The behaviour and transportation of electrons in waves.

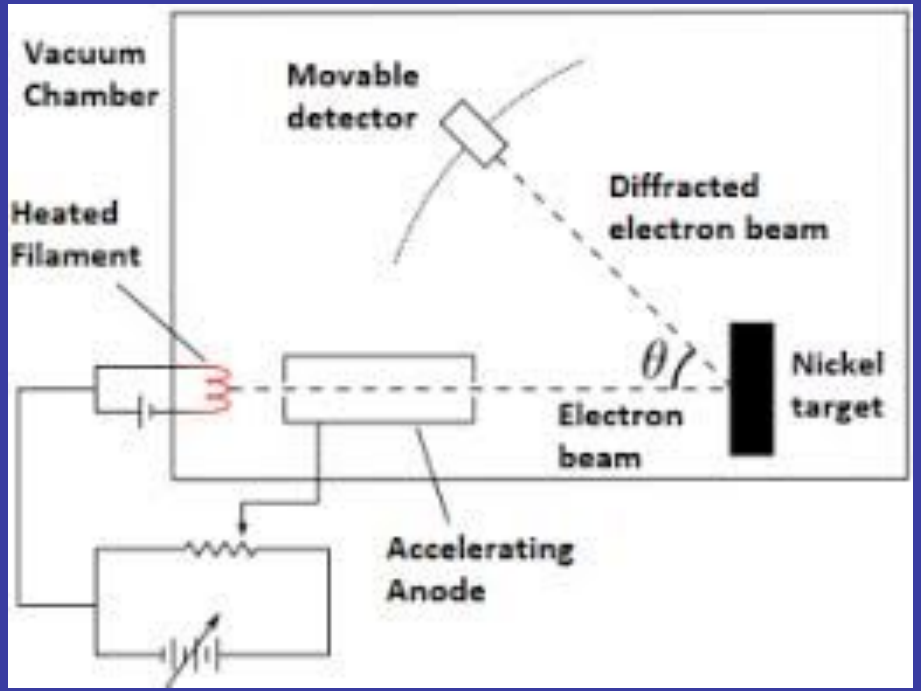
03 The extension of wave-like behaviour in particles to all matter.

De Broglie Hypothesis

Particles of matter exhibit wave properties.

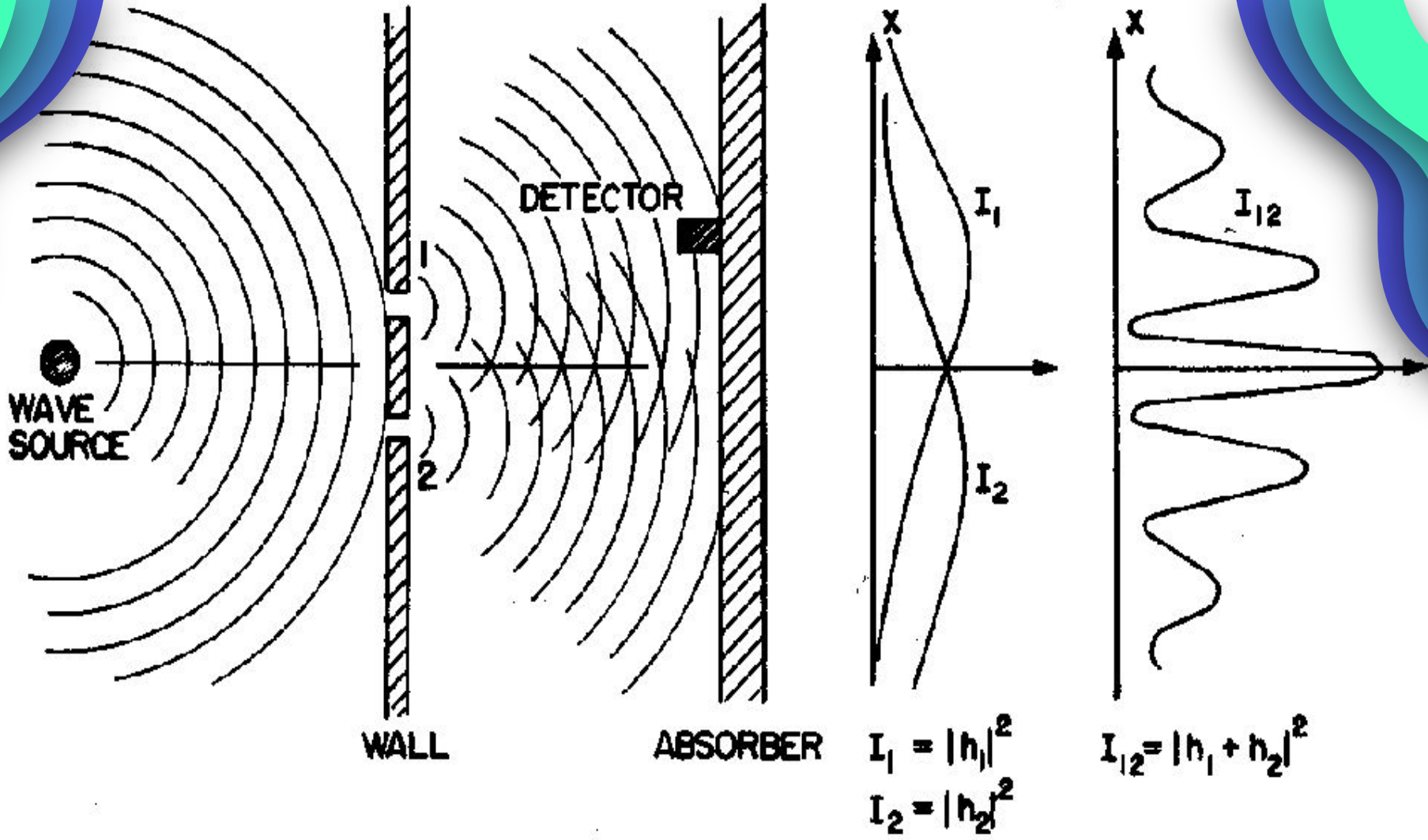
Wave-Particle Duality

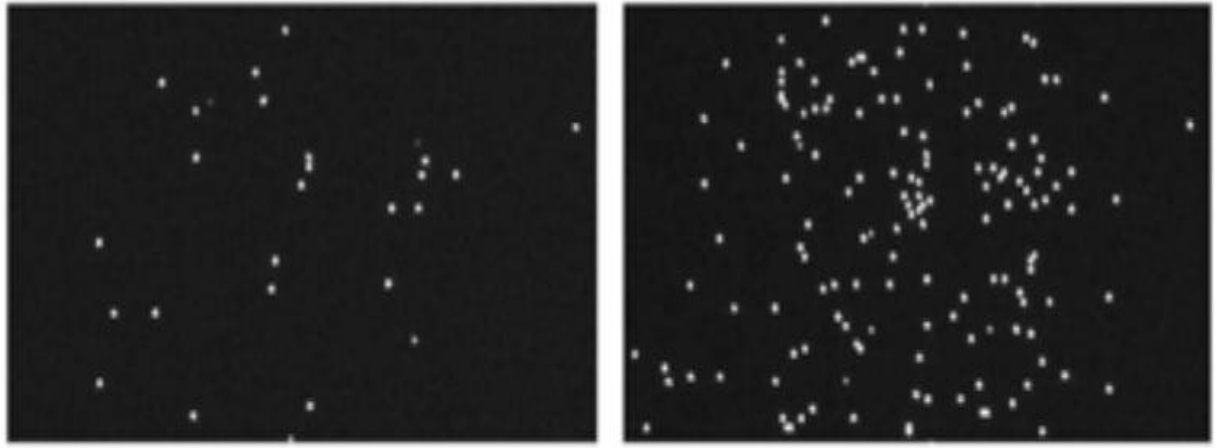
Davisson-Germer Experiment, 1923-27



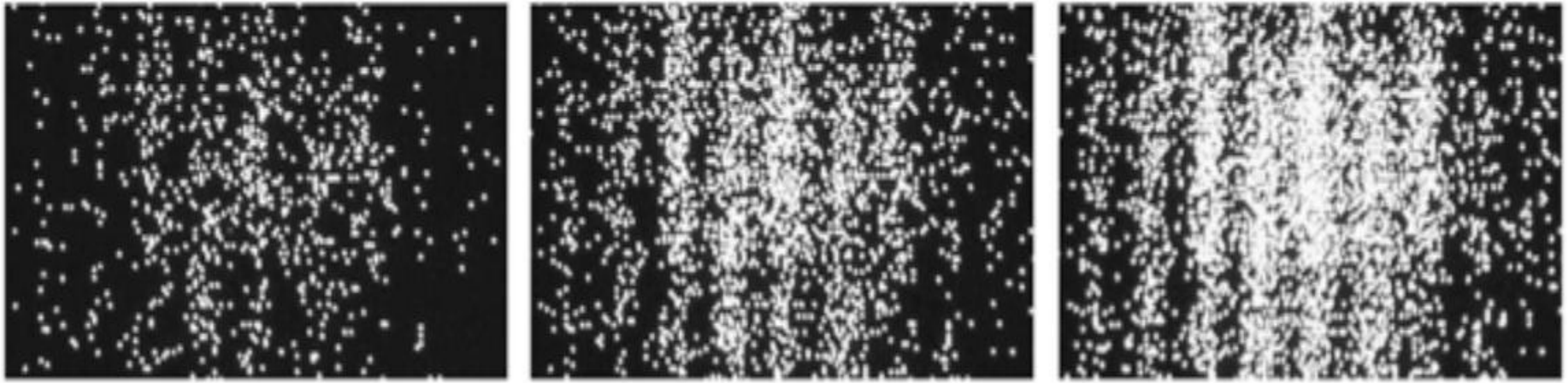
Electron diffraction experiment that proved De Broglie's hypothesis:

Scattered electrons produced an interference pattern characteristic of wave-like behaviour.


WAVE SOURCE
1
2
DETECTOR
WALL
ABSORBER
x
I_1
I_2
x
I_{12}
$I_1 = |h_1|^2$
$I_2 = |h_2|^2$
$I_{12} = |h_1 + h_2|^2$



(a) (b)



(c) (d) (e)

DE BROGLIE'S WAVELENGTH EQUATION

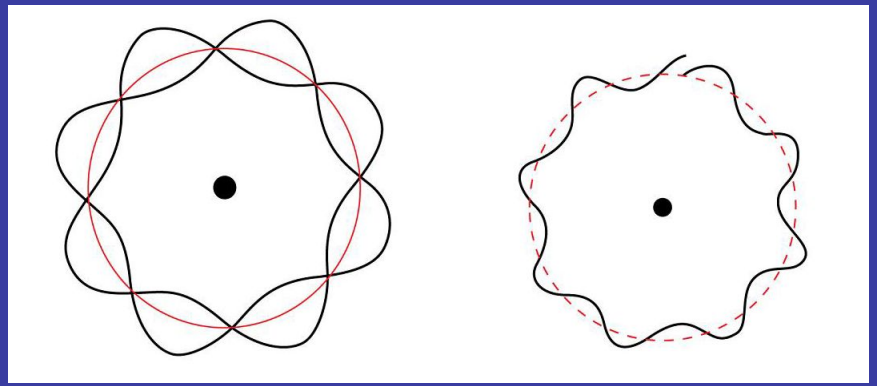
$$\lambda = \frac{h}{p}$$

where λ is the wavelength, p is momentum, and h is Planck's constant

$$E = mc^2$$

$$E = h\nu$$

APPLYING DE BROGLIE'S HYPOTHESIS TO THE BOHR MODEL



- Gave an explanation for the quantum behaviour of the electron Bohr had previously described
- Whole numbers of the de Broglie wavelength gave the allowed radii of the Bohr Model

LASTING CONTRIBUTIONS

- Describing a mechanism in Bohr's hypothesis of electrons only existing at allowed energies
- Using de Broglie's work, Schrodinger was able to create his wavefunction equation

QUESTIONS?