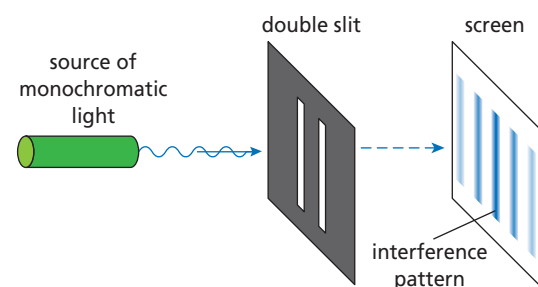


Quantum leaps

Founding experiments of quantum mechanics

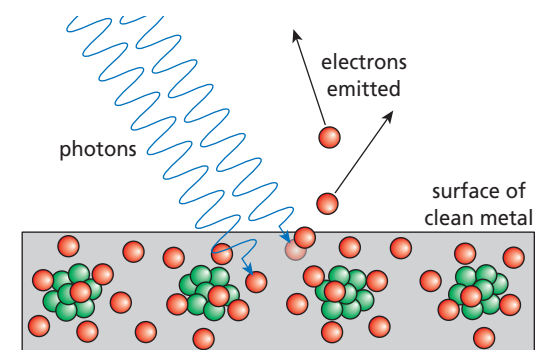
1 Double-slit experiment, 1801 (Thomas Young)



Light passing through a double slit produces an interference pattern because light is a wave (electromagnetic).

1801

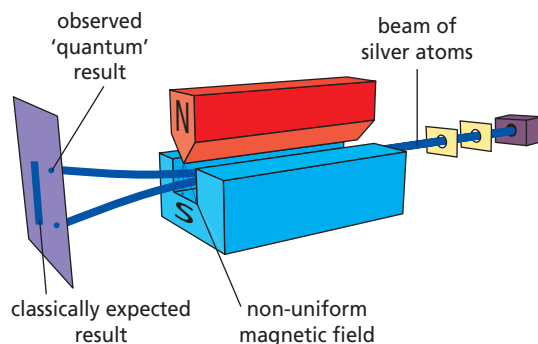
2 Photoelectric effect, 1887 (Heinrich Hertz)



Electromagnetic waves of a high-enough frequency can eject electrons from a clean metal surface. Below a threshold frequency electromagnetic waves cannot emit electrons from the metal, no matter how intense the radiation. In 1905 Einstein explained how this effect demonstrated that electromagnetic waves could transfer energy to matter only in discrete packets of energy – or ‘quanta’.

1887

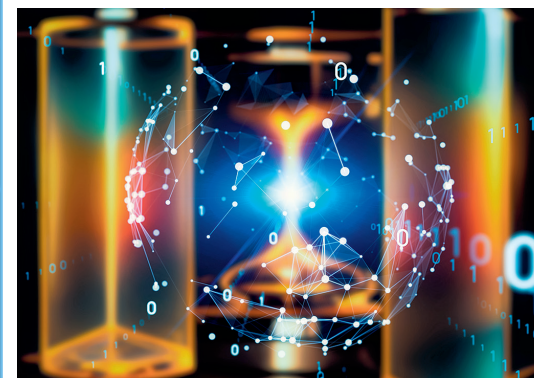
3 Stern–Gerlach experiment, 1922



By observing the deflection of silver atoms through a non-uniform magnetic field, it was shown that particles possess an intrinsic angular momentum (spin) that can only take certain quantised values.

1922

6 International Year of Quantum Science and Technology, 2025

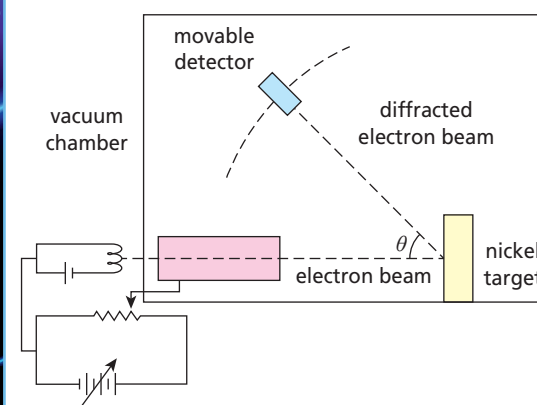


Quantum mechanics has certainly moved forwards since these early experiments.

Today, quantum mechanics is at the heart of many industries, and is essential for developing new materials. Future financial infrastructures will be secured by quantum information, and quantum computers will improve the accuracy of long-term climate models. Quantum engineering is already leading to more efficient and affordable solar cells and low-emission LED light sources. Quantum mechanics is here to stay, and will feature large in our future development.

2025

4 Davisson–Germer experiment, 1927 (and G. P. Thomson, independently)



When particles, like electrons, are fired through metal crystals they create an interference pattern identical to what would be expected if they were waves. This experiment confirmed de Broglie’s theory (1924) that any moving particle will be associated with a wave character.

1927

5 Schrödinger’s cat thought experiment, 1935



This conjured-up image of a cat in a box that is both dead and alive until it is observed, was used to illustrate an interpretation of quantum mechanics – that subatomic objects can exist in all possible states, at the same time, until observed, at which point they assume a specific state.

1935

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