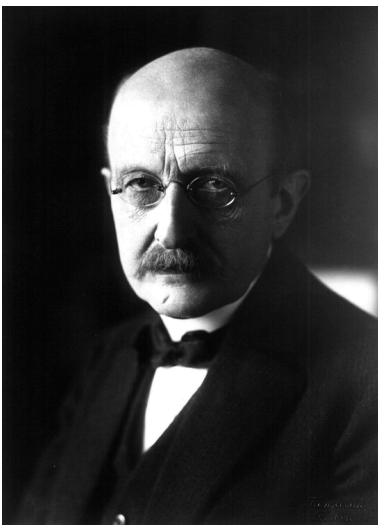


“On the Law of Energy Distribution in the Normal Spectrum”

Max Planck, 1900

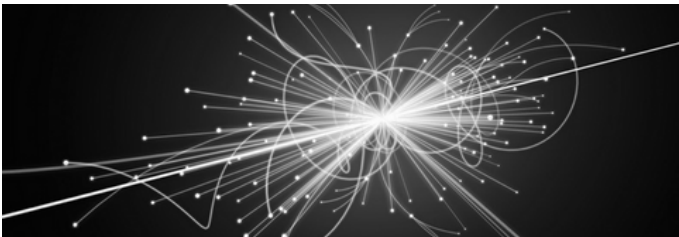
Max Planck was a German theoretical physicist best known for his groundbreaking work in quantum theory, which revolutionized modern physics. He is considered the father of quantum mechanics, and was awarded the Nobel Prize in Physics in 1918 for his contributions to the understanding of atomic and subatomic processes.



Key Concepts of “The Quantum Theory of the Electron”

Quantization of Energy

Planck proposed that energy is not continuous but comes in discrete packets, or "quanta." This quantization meant that energy could only be absorbed or emitted in fixed amounts rather than any arbitrary value.



Blackbody Radiation

Planck’s work primarily focused on solving the blackbody radiation problem, which dealt with how objects emit electromagnetic radiation based on their temperature. Planck's theory provided the correct formula for energy distribution by introducing quantized energy levels. His solution explained that the energy emitted by a blackbody at different wavelengths was not continuous.



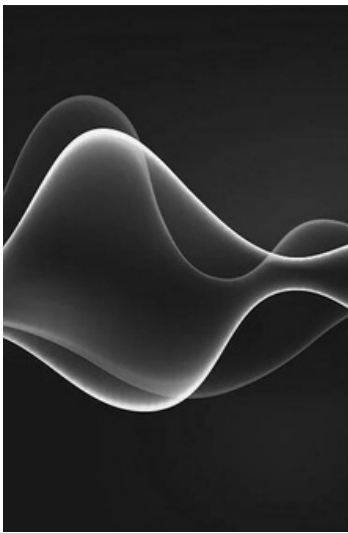
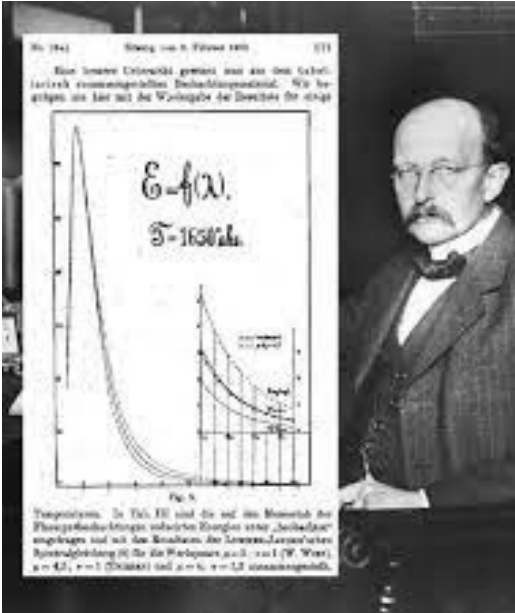
$$E = h\nu = \frac{hc}{\lambda}$$

Planck’s Constant

Planck introduced a new fundamental constant, now known as Planck’s constant ($h \approx 6.626 \times 10^{-34} \text{ Js}$), which describes the relationship between energy (E) and frequency (ν) through the equation $E = h\nu$. This was revolutionary because it indicated that the energy of radiation is directly proportional to its frequency, meaning that higher frequency light has more energy.

Scientific Context Before Planck’s Paper

At the end of the 19th century, classical physics seemed to have explained most observable phenomena, but it struggled to account for certain anomalies in thermal radiation, specifically blackbody radiation. Classical theories, such as Rayleigh-Jeans Law, predicted an "ultraviolet catastrophe," where energy output at short wavelengths would approach infinity. This clearly did not match observed data and indicated a major problem in physics.



Impact of Planck’s Paper

Planck’s quantum hypothesis reshaped physics, leading to the development of quantum mechanics — a field that revolutionized the understanding of atomic and subatomic particles. His work influenced future advancements in technologies such as semiconductors, lasers, and quantum computing, making it one of the most important contributions of modern science.

Want to Learn More?

Books:

- “Quantum Mechanics: The Theoretical Minimum” by Leonard Susskind
- “Planck: Driven by Vision, Broken by War” by Brandon R. Brown