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Quantum or Wave Mechanics

L. de Broglie
(1892-1987)

de Broglie (1924) proposed that *all moving objects* have wave properties.

$$\lambda = \frac{h}{m \cdot v}$$

v is velocity or speed

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Where did deBroglie's equation come from?

It was a *derivation* from Einstein's equation and Planck's equation!

$E = mc^2$ $E = h \cdot f$

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Compare the λ for a moving car and a moving electron

Car moving at 55 mph (about 25 m/sec)
mass = 910 kg

Electron moving at same speed
mass = 9.11×10^{-34} kg

Quantum or Wave Mechanics

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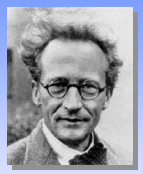

E. Schrodinger
1887-1961

Schrodinger applied idea of e- behaving as a wave to the problem of electrons in atoms.

He developed the **WAVE EQUATION.**

Solution gives set of math expressions called **WAVE FUNCTIONS, Ψ**

WAVE FUNCTIONS, Ψ

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- Each Ψ corresponds to an **ORBITAL** — the region of space within which an electron is found.
- Ψ does *NOT* describe the exact location of the electron. (Heisenburg's Uncertainty Principle)
- **KEY POINT: Schroedinger's equations are mathematical equations that describe the probability of finding an electron. These equations can be graphically represented on x-y-z axes.**

Schrodinger's Wave Equations

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- Are MATHEMATIC EQUATIONS which can be graphically represented on 3 axes (x, y, z).
- These wave equations are actually PROBABILITY DISTRIBUTIONS which can tell you where an electron will likely be found.
- These equations use CALCULUS to solve.
- We will show you the GRAPHIC REPRESENTATIONS (pictures) of these calculus equations on an x, y, z axis.