

How does de-Broglie postulate enter into the Schroedinger theory?

"The fundamental idea of [my 1924 thesis] was the following: The fact that, following Einstein's introduction of photons light waves, one knew that light contains particles which are concentrations of energy incorporated into the wave, suggests that all particles, like the electron, must be transported by a wave into which it is incorporated... My essential idea was to extend to all particles the coexistence of waves and particles discovered by Einstein in 1905 in the case of light and photons." "With every particle of matter with mass m and velocity v a real wave must be 'associated'", related to the momentum by the equation:

$$\lambda = \frac{h}{p} = \frac{h}{mv} \sqrt{1 - \frac{v^2}{c^2}}$$

where λ is the wavelength, h is the Planck constant, p is the momentum, m is the rest mass, v is the velocity and c is the speed of light in a vacuum."

This theory set the basis of wave mechanics. It was supported by Einstein, confirmed by the electron diffraction experiment of Davisson and Germer, and generalized by the work of Schrödinger.

From a philosophical viewpoint, this theory of matter-waves has contributed greatly to the ruin of the atomism of the past. Originally, de Broglie thought that real wave (i.e., having a direct physical interpretation) was associated with particles. In fact, the wave aspect of matter was formalized by a wavefunction defined by the Schrödinger equation, which is a pure mathematical entity having a probabilistic interpretation, without the support of real physical elements. This wavefunction gives an appearance of wave behavior to matter, without making real physical waves appear. However, until the end of his life de Broglie returned to a direct and real physical interpretation of matter-waves, following the work of David Bohm. The de Broglie–Bohm theory is today the only interpretation giving real status to matter-waves and representing the predictions of quantum theory. But, since it has some problems and doesn't go further in its predictions than the Copenhagen interpretation, it is little recognized by the scientific community.