Pilot Wave theory:

The Pilot Wave theory of Quantum Mechanics was the first known example of a hidden variable theory, presented by Louis de Broglie in 1927.

It uses the same mathematics as mainstream (Copenhagen) quantum mechanics; consequently, it is also supported by the current experimental evidence to the same extent as the mainstream interpretations.

Pilot wave theory is a hidden variable theory. The positions and momenta of the particles are considered to be the hidden variables. However, the observer not only doesn't know the precise value of these variables, but more importantly, cannot know them precisely because any measurement disturbs them – as stipulated by the Heisenberg uncertainty principle.

A collection of particles has an associated matter wave, which evolves according to the Schrödinger Equation. Each particle follows a deterministic trajectory, which is guided by the wave function.

The theory manifests nonlocality that is implicit in the non-relativistic formulation of quantum mechanics.

According to pilot wave theory, the point particle and the matter wave are both real and distinct physical entities. (Unlike standard quantum mechanics, where particles and waves are considered to be the same entities, connected by wave-particle duality.) The pilot wave guides the motion of the point particles as described by the guidance equation.

Ordinary quantum mechanics and pilot wave theory are based on the same partial differential equation. The main difference is that in ordinary quantum mechanics, the Schrödinger equation is connected to reality by the Born postulate, which states that the probability density of the particle's position is given by $\rho = |\psi|^2$. Pilot wave theory considers the guidance equation to be the fundamental law, and sees the Born rule as a derived concept.

In the de Broglie–Bohm picture of quantum mechanics there can exist empty waves, represented by wave functions propagating in space and time but not carrying energy or momentum and not associated with any particle.

in 1952, David Bohm, dissatisfied with the prevailing orthodoxy, rediscovered de Broglie's Pilot Wave theory and developed it into what is now called the De Broglie-Bohm theory.

The de Broglie-Bohm theory itself might have gone unnoticed by most physicists, if it had not been championed by John Bell, who also successfully countered Pauli's and von Neumann's objections to it. These ojections really only showed that the Pilot Wave theory did not have locality.

Yves Couder and co-workers recently discovered a macroscopic pilot wave system in the form of walking droplets. This system exhibits behaviour of a pilot wave, heretofore considered to be reserved to microscopic phenomena.

http://en.wikipedia.org/wiki/Pilot_wave