Eigenfunction Encyclopedia Article

Eigenfunction

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Eigenfunction

As used in quantum **mechanics** to describe solutions for Schrödinger equations, the term Eigenfunction derives from the Germanic *Eigenfunktion*, meaning characteristic or proper function. Eigenfunctions correspond to particular eigenvalues (derived from the Germanic *Eigenwert* to mean the characteristic or proper values). In **quantum physics** eigenfunctions yield defined and discrete eigenvalues related to quantized values used to describe various attributes of a body or system(e.g., **quantum numbers**).

The postulates of **quantum mechanics** state that the physical state of a system can be fully described by specific types of wave functions that can be obtained by solving Schrödinger's equation. Such functions that are possible solutions of this equation are called eigenfunctions or characteristic functions. They exist only for specific eigenvalues or characteristic values of **energy**. In quantum mechanical calculations, every dynamic variable that correlates with a physically observable property (such as position, **linear momentum**, **angular momentum**, **time**, **kinetic energy**, **potential energy**, etc.) is represented by a linear operator. Operators are derived from classical expressions for these properties and, as their name implies, they operate on a function to yield another function, an eigenfunction, that only differs from the first by a constant factor (an eigenvalue).

For example, in quantum mechanical calculations to obtain specific values for energy, the wavefunction is operated with the Hamiltonian operator associated with energy. The solutions of the Schrödinger equation yield only quantized values of energy (i.e., eigenvalues of energy).