

One idea behind the expansion of waves in media and vacuum involves the creation of a space filling curve that contains more dimensions of amplitudes from the greater amplitude function $A(s, t)$ or $A_n(s, t)$ where these n are the number of dimensions where the amplitude exists. A separation of variables approach is useful in wave analysis as each dimension is separable and orthogonal, thus creating one dimensional problem. Also, each order of polynomial is also orthogonal, creating this new type of orthogonal system that extends to infinity. Perhaps mathematicians discuss this pattern of orthogonality. It is useful to describe the nature of (s, t) as $(x^2 + y^2 + z^2 + c^2 t^2)$ which is the four vector of relativity. Extending this argument to more dimensions is contentious and non-intuitive, but the abstraction of the Aharonov-Bohm effect shows us that there are hidden dimensions that somehow manifest in reality through quantum interactions.

$$H|\psi\rangle = \frac{\hbar^2 \nabla^2}{2\mu} |\psi\rangle + \hat{V}|\psi\rangle = -i\hbar \frac{\partial |\psi\rangle}{\partial t} \quad (1)$$

It is critical to know how waves expand in volumes or regions of interest. Generally, the Green's function approach works, but these are just mathematical techniques to describe the wave solutions with the forms of polynomials and potentials from a delta function source term. We are really looking into the shape of the differential equation and the terms in the equation as they relate to the recursion. From before:

$$G(r, r', E) = \left(\frac{1}{2\pi}\right)^3 \frac{2\mu}{\hbar^2} \int_0^\infty k^2 \partial k \int_0^{2\pi} \partial \phi \int_0^\pi \frac{\sin \theta \partial \theta e^{i \cdot k s \cos \theta}}{K^2 - k^2} \quad (2)$$

We also have:

$$\nabla^2 G(x, x') = -4\pi \delta(x - x') \quad (3)$$

This fundamental result is the combination of the curvature of the Green's function (or the wave) with the special delta source or pointlike source. This will give us our potential field of a point source from the Poisson and Maxwell relations. An interesting relation you can find in my notes after describing some of the machinery of the mathematics of the Green's function, is the differential form.

$$\nabla^2 |\psi\rangle - \frac{1}{c^2} \frac{\partial^2 |\psi\rangle}{\partial t^2} = -4\pi f(x, t) \quad (4)$$

We have the wave shape and the time dependence. From before:

$$\int \partial^3 r' \langle \vec{k} | \vec{r} \rangle \langle r' | W | \vec{k}; + \rangle = \left(\frac{1}{2\pi}\right)^{\frac{3}{2}} e^{i \vec{k} \cdot \vec{r}} \left(-\frac{\mu}{2\pi \hbar^2}\right) \frac{2\pi^{\frac{3}{2}} e^{i \vec{k} \cdot \vec{r}}}{r} \langle \vec{k} | W | \vec{k}; + \rangle \quad (5)$$

We have to find the space filling curve.

$$[A_n(s, t) \sum_{N=0}^{\infty} SU(N)] \otimes SU(N) = \sum_0^{\infty} e^{i \cdot k(x^2 + y^2 + z^2)} \otimes e^{i \cdot \omega c^2 t^2} \quad (6)$$

For lack of a better description of space filling waves, we have the tensor of the Yang-Mills and the wave exponential which generates the self-similarity.

We need the xeta calculus to enter, to change with the inflationary punctuated equilibrium model.

$$[A_n(s, t) \sum_{s, t, N=0}^{\infty} SU(N)] \otimes SU(N) \zeta(s, t) = \sum_0^{\infty} e^{i \cdot k(x^2 + y^2 + z^2)} \otimes e^{i \cdot \omega c^2 t^2} \frac{\Gamma(s) + 1}{\Gamma(s + 1)} \quad (7)$$

This is the Gamma matrix expansion of the spatial component. It makes dimensions iterate. They are self similar.