# Hypersphere Mechanics.


**Peter J Carroll**

**Kingsown House, Unity Street, Bristol, BS2 0HN UK.**

**pete@specularium.org**



**Abstract.** This paper discusses the idea that fundamental quanta may consist not of 'point particles' but of sub-Planck scale hyperspheres (3-balls or 4-spheres) in their particle-like manifestations, and that the Uncertainty Principle constrains them to have wavelengths and frequencies above the Planck scale in their wave-like manifestations. This paper then conjectures that some form of 'hypersphere mechanics' may form yet **another possible interpretation of quantum physics,** which may eventually yield novel testable predictions.


## Hypersphere Mechanics.

The Planck length and the Planck frequency (the inverse of the Planck time) in their squared form seem to define the following limits to quantum phenomena if we accept that $\frac{Gm}{c^2}$ represents the antipode length below which matter forms a hypersphere and resists further compression.

See http://vixra.org/abs/1601.0026

(For the sake of simplicity this paper does not distinguish between Planck's constant and Planck's constant reduced.)

If the Cartan volume sets the minimum cross sectional area for any quantum as suggested by the following possible decompositions of it: -

See http://vixra.org/pdf/1611.0133v1.pdf

$v_v = \frac{Gh^2}{mc^4} = \frac{Gh}{c^3} \; \frac{h}{mc}$ Cartan volume as Planck area times the Compton wavelength.

$v_v = \frac{Gh^2}{mc^4} = \frac{Gm}{c^2} \; \frac{h^h}{m^2c^2}$ Cartan volume as hypersphere antipode length times the square of the Compton wavelength.

Then the Planck area represents the smallest cross sectional area of a quantum and the actual constraint on the size of a quantum rather than the Planck length. It also suggests that the quantisation of spacetime occurs at the level of the square of the Planck lengths and times.

So decomposing the Planck area and also the square of the Planck frequency yields the following: -

Particle x Wave = Planck quantity$^{2}$

$$\frac{Gm}{c^2} \quad \frac{h}{mc} = \frac{Gh}{c^3} \quad \text{Length}$$

$$\frac{c^3}{Gm} \quad \frac{mc^2}{h} = \frac{c^5}{Gh} \quad \text{Frequency}$$

Thusly we can separate out the particle and wave manifestation of a quantum and perhaps conceive of the position of the particle as described probabilistically by the associated wave.

This description recovers the observed properties of waves such as Compton wavelength and the familiar relationships of wavelength x frequency = lightspeed, and E = hf.

This description of the particle manifestation of a quantum also recovers the familiar $E = mc^2$ as any hypersphere 'spins' intrinsically at lightspeed. Matter represents a huge amount of energy somehow 'locked up'; this paper suggests that this energy becomes locked up as hyperspherical angular momentum. Note that all parts of a hypersphere have this 'spin' in which they vorticitate around hyperspherical great circles. See:-

http://vixra.org/abs/1611.0323

This suggests that all quanta have in their heart a spinning hypersphere.

The Planck quantities then appear as limits to the sizes of fundamental quanta, as we can see from the equation: -

$$\frac{Gm}{c^2} \quad \frac{h}{mc} = \frac{Gh}{c^3}$$

If fundamental particles had masses approaching the Planck Mass $m_p = \sqrt{\frac{hc}{G}}$ then their internal hyperspheres would approach the same size as their Compton wavelengths and such quanta would collapse into each other to form an expanding hypersphere which would appear as a runaway black hole to an outside observer. In reality all fundamental quanta have masses well below $m_p = \sim 2 \times 10^{-8}$ kg and the heavier ones tend to disintegrate well below this level.

The 'spins' of a macroscopic hyperspheres like the universe itself can have very large numbers of degrees of freedom.

Quantum hyperspheres may have constraints which give rise to their electric/electroweak, strong nuclear, generational and particle spin properties. These await a fuller explication. Borsak-Ulam theory can account for the superposed properties that appear when we treat hyperspheres as lower dimensional objects.

As Roger Elman observes here: -

http://www.wseas.us/e-library/conferences/2011/Cambridge/NEHIPISIC/NEHIPISIC-15.pdf

'The two effects, electro-magnetic and gravitational, being so intimately linked at their particle sources, it would seem somewhat absurd for material reality to involve two different, simultaneous, overlapping oscillatory propagations, one for each of the two effects. Rather, there should be a single underlying oscillatory propagation for the two, gravitational and electro-magnetic, although its method of interacting with other encountered matter be different for the two effects with the result of producing the two different behaviours.'

If so we perhaps have some bridge from General Relativity to Quantum Mechanics which looks more like a 4+1D quantum geometry than a 3+1D quantum gravity.

Peter J Carroll. 8/11/16.