We address the ~122 orders of magnitude discrepancy between the cosmological constant (dark energy) and the vacuum fluctuation density predicted by quantum field theory and deemed the so-called "virtual catastrophe."

Utilizing a quantized solution to gravity we consider the total mass-energy density in the geometry of a spherical shell universe (as a first order approximation) and find the result to be closely correlated with the currently observed density of the Universe.

We discuss the validity of such an approach and consider its implications to cosmogonic and universal evolution.

QUANTIZED SOLUTION TO GRAVITY

In previous work\[29]\[30], a quantized solution to gravity is given in terms of Planck Spherical Units (PSUs or 'vortices'), defined as:

$$\text{PSU} = V_p = \frac{1}{2\pi c^3}$$

where $V_p$ is the Planck volume. The Planck density $\rho_p$ or quantum vacuum density $\rho_{vac}$ was subsequently more accurately calculated in terms of PSUs: $\rho_p = \frac{\rho_{vac}}{c^3} = 9.86 \times 10^{-47} \text{g/cm}^3$.

The mass-energy density of any spherical body can therefore be considered in terms of its PSU packing, and can be defined as a ratio, $R$, of any spherical volume, $V$ to PSU: $R = \frac{V}{V_p}$ where the corresponding mass-energy, $Rm$, can be calculated in terms of Planck mass: $Rm = \frac{V}{V_p} m_p$.

In the case of the proton, $Rm_p = 2.46 \times 10^{23} \text{g}$, which is equivalent to the mass of the observable universe -- indicating that the mass-energy of all protons in the observable universe could be holographically stored in the mass-energy density of any one proton!

Following the holographic principle of Hoyle\[31]\[32] based on the Bekenstein-Hawking formula for the entropy of a black hole,\[33]\[34]\[35] Haramein\[36] defines the holographic bit of information as the equatorial disc of the oscillating PSU. These PSUs, or Planck vortices, tile along the area of the proton surface horizon, producing a holographic relationship with the interior information mass-energy density. The ratio of the information bit to the spherical surface is thus defined as $\eta = \frac{Rm}{\text{area}}$ (where $\text{area}$ is the surface area of the spherical body and $A_{bc}$ is the area of the PSU equatorial disc).

It is then shown that the ratio of the interior vacuum energy density to the surface horizon Planck tiling yields an exact quantized derivation of the Schwarzschild solution to Einstein’s field equations, and thus a quantized approach to gravity is found, where:

$$R = \frac{V}{V_p} = 10^{16}$$

The solution applied at the nucleon scale, defines:

$$m_n = \frac{2}{3} m_p = \frac{2}{3} m_e$$

The rest mass of the proton is given as a function of the Planck vacuum oscillators (PSUs) holographic space to volume geometrical relationship of space-time, $\phi$, thus resolving the hierarchy problem between the Planck mass and the proton rest-mass: "We see that the question is poses is not, 'Why is gravity so feeble?' but rather, 'Why is the proton mass so small?' For in natural (Planck) units, the strength of gravity simply is what it is, a primary quantity, while the proton mass is the tiny number ..." - Frank Wilczek, 2001\[37]

$$r_p = 4 \frac{V_p}{m} = 0.8412357 \times 10^{-13} \text{cm}$$

This quantized solution to gravity successfully predicts the radius of the proton to within 0.000365 x 10^-13 cm of the 2013 muonic charge radius of the proton!