

# The Mathematical Origin of Gravitational Singularities

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## Abstract

In this note we give a geometrical presentation to the 4D Riemannian curvature as it relates to the Newtonian gravity in the 4D Lorentz manifold. The compacting of the proper time as is necessary for the unification with the Maxwell electrodynamics, as given by Einstein and Kaluza-Klein, should the universe be only of 4D space-time, led to the concept of gravitational field singularity sinks known as black holes, that would not be acceptable under a 5D homogeneous manifold through which the 4D Lorentz manifold evolved by application of the Perelman-Ricci Flow entropy mapping, which is consistent with both Maxwell suggested magnetic monopole, the quantum Higgs vacuum theory and the Gell-Mann standard model for hadrons.

## Keywords

Black Hole, Gravitational Field Singularities Within a Lorentz Manifold, Proper Time Compacting, Perelman Mappings as It Relates to Riemannian Curvature

## 1. Introduction

In order to understand gravity, it is necessary to start from Special Relativity, which states no matter can travel faster than the speed of light  $c$  in a 4D space-time manifold. Therefore, the 4D space-time manifold must be expressed in terms of the Lorentz manifold. Namely

$$(ct)^2 - (c\tau)^2 = \sum_{j=1}^3 x_j^2 \quad (1)$$

where  $\tau$  is a constant.

The Fourier representation is then given by

$$E^2 - (mc^2)^2 = \sum_{j=1}^3 (cp_j)^2 \quad (2)$$

where  $m > 0$  represents a mass.

In order that the 4D space-time covers the massless electromagnetic fields, which obeys the homogeneous 4D Maxwell manifold [1], where  $\tau$  is 0, the 3D coordinates must be homogeneous, thus satisfying spherical symmetry, hence expressed in the Fermat's sum [2]

$$(ct)^2 = r^2 \quad (3)$$

where the Fermat's amplitude is the radius of a sphere.

It should be noted that should one replace  $\tau$  as  $x_4$  and moved to the r.h.s. in Equation (1), do NOT correspond to that we have a 5D homogeneous space-time manifold! [3] As electrodynamics is only given by the 4D homogeneous manifold. Hence, if it is expanded to a homogeneous 5D, it would result in a 5th potential field solution [4], namely the magnetic monopole potential as suggested by Maxwell. Should we take  $x_4$  literally as the 4th space dimension, then  $\tau$  is the result of a dimension projection from 5D into 4D [5]. In that case, and with space symmetry, the 4th space coordinate must be along " $r$ " the Fermat's amplitude, since the 5D homogeneous manifold satisfies the Fermat's last theorem, and is given in terms of Euler representation by three independent angles having ranges  $\pi$ ,  $2\pi$  and  $4\pi$  as shown rigorously in ref. [4], making it a degenerate radius for both the photons as well as a massless, charge 0, diagonal long range order Boson field, that is the Higgs fields [6], thus creating the Higgs Bose-Einstein vacuum that must occupy the universe wherever matter is absent. Hence if there is a gravitational field singularity region for masses in 4D, it would be removed by the outward pressure of the Higgs fields [7], thus eliminates such so-called Black Hole regions [8]. In fact, it would appear super bright as is observed at all galactic centers! And it explains why in galaxies stars spiral outward instead of collapsing into the galactic core [9].

## 2. The 4D Riemannian Curvature

To examine the gravity equation, we again must return to special relativity. Note the velocity of a moving mass depends on the observer's frame in relationship to the mass. Since Newtonian gravity is given w.r.t. the mass frame. Thus we must express the 4D coordinates in a covariant form. Hence it means  $x_\mu$  must transform by the Riemannian curvature [10]:

$$x_\mu = \sum_{\nu=0}^3 g_{\mu\nu} x^\nu \quad (4)$$

where

$$g_{\mu\nu} = \frac{\partial x_\mu}{\partial x_\nu} \quad (5)$$

Such that the line element  $ds$  is given by

$$ds^2 = \sum_{\mu, \nu} g^{\mu\nu} dx_\mu dx_\nu \quad (6)$$

By adding the 4 Maxwell potentials  $A_\mu$ ,  $g^{\mu\nu}$  becomes  $\gamma^{\mu\nu} - A^\mu A^\nu$  where  $\gamma^{\mu\nu}$  is the space curvature when either  $\mu$  or  $\nu$  is fixed as 4, the proper time component and  $\gamma^{\mu 4}$  becomes the time-space element, and  $A^4$  either represents the monopole potential or in Einstein's case equal to 0, by closing the integral  $x_4$  around itself, such that

$$ds^2 = \sum_{\mu, \nu} g^{\mu\nu} dx_\mu dx_\nu - (dx_4 - A_\mu dx^\mu)^2 \quad (7)$$

where  $x_4$  is the proper time  $\tau$  and NOT a 4th space coordinate. In fact this assumption on 4D space-time invalidates not just the absence of a monopole potential, but also the existence of a Bose-Einstein Higgs vacuum. Absence of it is problematic in the ability to justify the Gell-Mann Standard model [11]. Mathematically, it also invalidates the Perelman entropy Ricci-Flow mapping [12] that gives us the galactic Lorentz 4D manifold, and the Maxwell ghost w.r.t. non-symmetric photon distribution. Apart from these problems, a strict 4D space-time now leaves  $A'_4$  as a gravity potential  $\phi_g$  choice. Thus produces

$$g'_{\mu 4} = g_{\mu 4} + g_{44} \partial_\mu g \quad (8)$$

when we identify  $g'_{\mu 4}$  as the electromagnetic potential  $A'_\mu$  and  $g_{44}$  as the unit vector 1, it gives us the Lorentz gauge transformation

$$A'_\mu = A_\mu - \partial_\mu f \quad (9)$$

Keeping in mind

$$\tau^2 = \sum_{\mu=0}^3 \tau_\mu^2$$

This leads us to the linear line element for the EM unified 4D theory

$$ds = \delta \int d^4 x R_4 F_g + \delta \int d^4 x \left\{ -\frac{1}{4} F_{\mu\nu} F^{\mu\nu} \right\} F_g \quad (10)$$

where  $R_4$  is the invariant derived from the 4D curvature tensors, and  $g = \det g_{\mu\nu}$ , which gives us the Maxwell potential equation along  $r$ , in the spherical coordinates, together with gravitational field  $F_g$  inside the Lorentz manifold.  $F_{\mu\nu}$  is the electromagnetic tensor [12]. It is because both  $R_4$  and  $g$  are given by the Riemannian curvature, leading to a non-linear differential equation for the gravitation field equation, and the existence of a singularity as  $r$  in the 4D Lorentz metric approaches 0, thus creating the so call Black holes [8]. This solution can be removed if the proper time  $\tau$  as expressed in terms of  $x_4$  is not in a closed loop as suggested by Einstein [10] since, when 3D space becomes 0,  $t^2$  must become  $\tau^2$ , thereby leaving a region as discussed by Wheeler as a worm hole [13]. While in the homogeneous 5D theory [5], leads to the presence of a Higgs vacuum filled with B.E. Higgs fields that carry the infinite quantum energies which would produce a repulsive pressure cancelling the gravitational attractive singular field solution as  $t$  approaches 0. Invalidating the concept of the existence of gravitation field singularities within the universe.

To compare to the Newtonian gravitation the gravity equation as given by Equation (10) in turn can be formulated following in the cylindrical space coordinate variables as we observed for the galactic structures in the universe, which in fact geometrically agrees with the Perelman-Ricci flow mapping [14] [15] obtained from the homogeneous 5D manifold, but not from the covariant of the 4D Lorentz manifold as Einstein assumed:

$$g_{\varphi} = \left( \frac{\partial z}{\partial r} \right)_{\varphi} = -g_{-\varphi} \quad (11)$$

Hence under the Perelman-Ricci flow mapping, the rate of mass creation can be expressed in terms of  $\frac{\partial z}{\partial t} = \Gamma_z$  and  $\left( \frac{\partial r}{\partial t} \right)_{\varphi} = \Gamma_r$  [3]. To explain that let  $M(x_{\mu})$  be the mass distribution within the Lorentz manifold, similar to Einstein theory [10]. The covariant mass distribution rate becomes

$$S_{\mu} = \frac{\partial M}{\partial x_{\mu}} \quad (12)$$

By applying the 3D cylindrical frame, the rate of mass density change becomes

$$S_t = \frac{\partial M}{\partial t} \left\{ \frac{1}{\Gamma_z} \hat{z} + \frac{1}{\Gamma_r} \hat{r} \right\} \quad (13)$$

implying a non-symmetric mass density must be in the Lorentz manifold. In fact the value of  $G$  being small implies we have a very flat doughnut geometry for the Lorentz manifold containing a mass distribution [3] as in **Figure 1**. There,  $\tau_0$  varies [3] from an initial minimum value to  $\tau$  as a function of  $h$ , the thickness of the galaxy given by:

$$h = c(\tau - \tau_0) \quad (13a)$$

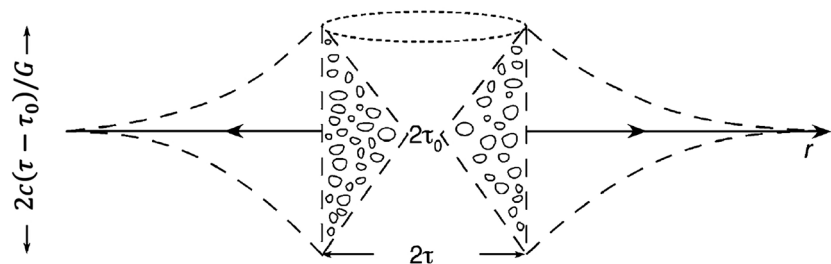
and

$$r = \int_0^t v dt \quad (13b)$$

where  $t$  is the galaxy age and  $v$  is dependent speed of expansion along  $r$ .

From Equation (10) as according to the Riemannian curvature in 4D, satisfies

$$g_{\varphi} = \left( \frac{\partial z}{\partial r} \right)_{\varphi} = \frac{\Gamma_z}{\Gamma_r} = \frac{1}{G} \quad (14)$$



**Figure 1.** Doughnut structure galaxy model in cross section depicting a time-extended projection action.

Because  $\Gamma_z$  and  $\Gamma_r$  are functions of  $t$ ,  $r$ ,  $\tau$  and  $A_\mu$ . In order to satisfy Equation (14),  $\Gamma_z$  and  $\Gamma_r$  must be of identical functions multiplied with a proportionate constant  $G$ . By following Einstein and compacting  $\tau$ , when  $r$  approaches 0,  $t$  must also approach 0, according to homogeneous 4D manifold. Therefore, this common function can be any arbitrary constant value  $C$  at  $r = 0$ . And according to uncertainty principle, and time reversal symmetry obeyed, energy must become + or - infinity at  $r = 0$ . Thus the gravitational field solution  $F_g$  within the Lorentz manifold must be singular at  $r = 0$ . With the + infinity equal to the creation of masses, such as in a galaxy around its bright core center. While the infinity energy then becomes a “black hole”, that is an infinite sink for matter to be reverted back into pure energy. Such gravitation singularities can be removed if the mass creation rates  $\Gamma_z$  and  $\Gamma_r$  are not continuous functions in  $r$  and  $t$ . In fact pictorially such discontinuous solution resembles an inward rotating mass density vortex. To remove this inward spiral into  $r = 0$ , physically an increasing outward repulsive pressure must build up as  $r$  decreases towards 0. Or if we can just eliminate time reversal symmetry from the Lorentz manifold. Starting with a 5D homogeneous space-time, time reversal is disallowed. And via a Perelman-Ricci Flow mapping, such a natural outward pressure is available via the existence of a Higgs vacuum in the 5D universe, which exist as  $r$  is geometrically a degenerate coordinate filled with Higgs bosons, with the homogeneous Maxwell 4D becoming the boundary for the homogeneous 5D manifold. Hence there are NO black holes sinks in the universe, contrary to the theory of Einstein [10] and Penrose [16]. Meaning no matter can be reverted into pure energy, due to gravitational field singularities. Current astronomical observation cannot be interpreted as verification of the existence of black holes in the universe [17]. A spiral mass inward flow is like a fire whirl with attenuation swirling [18] [19] fluid flow requiring adding vorticity and thermally induced motion. It cannot be reverted to pure energy as interpreted.

### 3. Conclusions

There appear mathematical errors made originally by Einstein and furthered by Penrose and others. The mathematical errors came from the derivation of the covariant Lorentz 4D Riemannian curvature equation that leads to the gravity potential associated with a mass.

As explained in above, if the universe is a 5D homogeneous manifold, then the boundary must be given by the 4D homogeneous Maxwell manifold, and thus there exist massless charge-less quantum fields as suggested by Maxwell given by the 4 component electromagnetic potentials and the orthogonal 5th magnetic monopole potential. With that relationship, the homogeneous 5D is filled entirely with energy carried by the monopoles, which are bosons in the Bose-Einstein condensed state as given by Higgs. And the presence of mass is the result of dimension projection onto the Lorentz 4D, as represented by irreversible Perelman entropy mappings, through the excitation of the monopoles states,

and that matters are expelled by their presence, thus completely removes the gravitation singularity.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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