A Comparison Between The Standard Cosmological Model and A Proposed Model with Radial Time and Independent Geometry

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(*To those possible intelligent creatures out of our solar systemwho use only logic and observation to evaluate scientific claims*)

Abstract

In this paper, a comparison is made between the standard cosmological model and a proposed model with spherical space and radial time and the field equation with the average density of the universe as another constant.

The Comparison

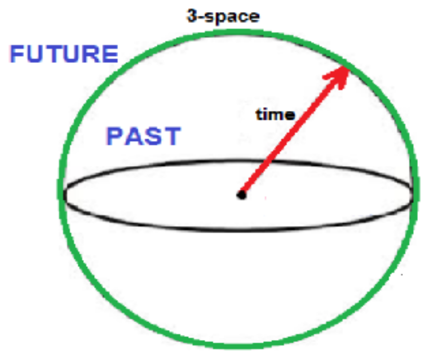
The two features which distinguish this proposed model from the standard model and the other existing ones although seem to be unrelated to each other , but as will be shown through this comparison ,they imply and complement each other :

Firstly:*the space-time is a 4-sphere in which the 3-dimensional surface represents the 3-space of the universe and the radius represents the time.*

Secondly:*in addition to the ordinary cosmological constant there is another cosmological constant subtracted from the right-hand side of the field equation, this new constant is the average of all stress energy tensor of the universe.*

These two assumptions lead to many interesting results as will be shown and not to forget here the great advantage that they permit the space to take the nature's favorite shape " spherical " and at the same time reveal the special character of the time dimension as the radius of the sphere of the other three dimensions of space.

1) The Shape of The Space-time

Standard Model	Proposed Model
WIKIPEDIA La enciclopedia libre List of Unsolved Problems in Physics Shape of the Universe What is the three -manifold of comoving space ...informaly called the shape of the universe ? Neither the curvatue nor the topology is presently known 2 Sep. 2o15	

2) The Field Equation

The appearance of the quantity($k\,T_{\mu\nu}^{average}$) in the field equation has no practical result on the local application of the field equation inside or near heavy bodies because of the small value of the present average stress-energy tensor of the universe while it leads to totally different result in the application of the field equation to the universe as a whole.

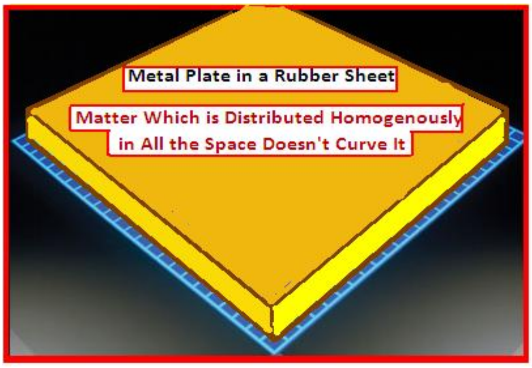
Standard Model	Propoesd Model
$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R + g_{\mu\nu} \Lambda = kT_{\mu\nu}$	$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R + g_{\mu\nu} \Lambda = kT_{\mu\nu} - k\,T_{\mu\nu}^{average}$ Which leads to : $G_{\mu\nu} - G_{\mu\nu}^{global} = kT_{\mu\nu} - k\,T_{\mu\nu}^{global}$ $T_{\mu\nu}^{average} = T_{\mu\nu}^{global} =$ the average stress-energy tensor of the universe

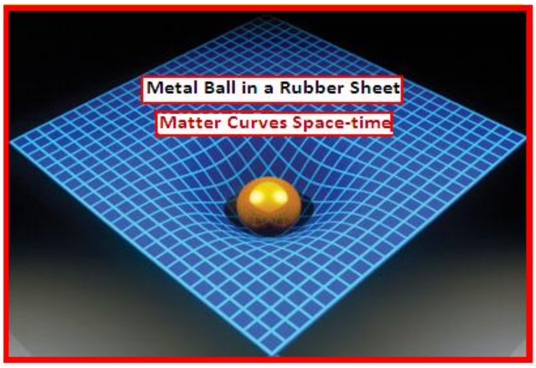
3) Other Equations

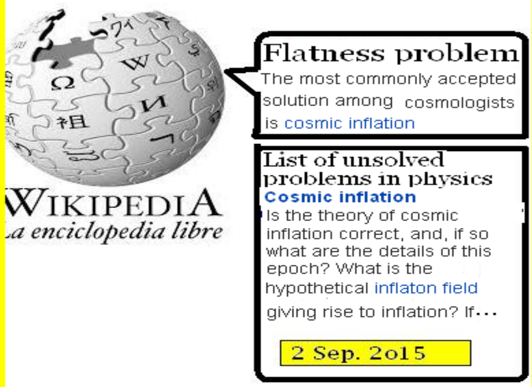
Standard Model	Propoesd Model
Friedmann equations $\frac{\dot{a}^2 + kc^2}{a^2} = \frac{8\pi G\rho + \Lambda c^2}{3}$ $\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}\left(\rho + \frac{3p}{c^2}\right) + \frac{\Lambda c^2}{3}$	The Volume of the universe $\propto$ T^3 Hubble's Constant $\propto$ $\frac{1}{T}$ The Cosmological Constant $\propto$ $\frac{1}{T^2}$ Where T is the age of the universe

4) The Flatness Problem

The existence of the average density of the universe subtracted from the right-hand side of the field equation implies that the global geometry of the universe is independent from any matter or energy that is distributed homogenously in all the space.





<table>
<tr><th>Standard Model</th><th>Proposed Model</th></tr>
<tr><td>
</td><td>The independence of the large-scale geometry of the universe from the average density of matter eliminates the flatness problem because the concept of the critical density becomes meaningless.</td></tr>
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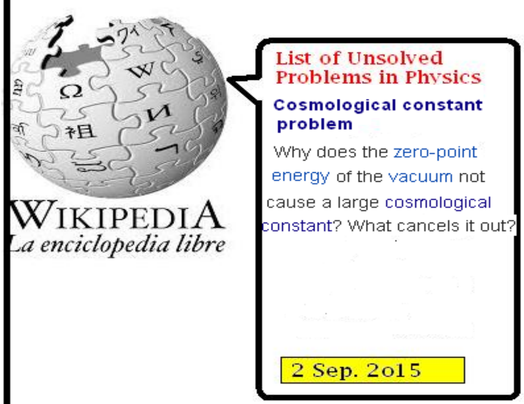
5) The Cosmological Constant Problem and Dark Energy

<table>
<tr><th>Standard Model</th><th>Proposed Model</th></tr>
<tr><td>
</td><td>Because of the existence of the term ($k\,T_{\mu\nu}^{average}$) subtracted from the right-hand side of the field equation ($k\,T_{\mu\nu}$) it is clear that in the case of a homogeneous distribution of matter and energy throughout the universe the geometry of the universe does not depend on the value of the average stress-energy tensor because in this case the stress-energy tensor in every region is equal to its average and thus the right-hand side of the field equation is always zero.</td></tr>
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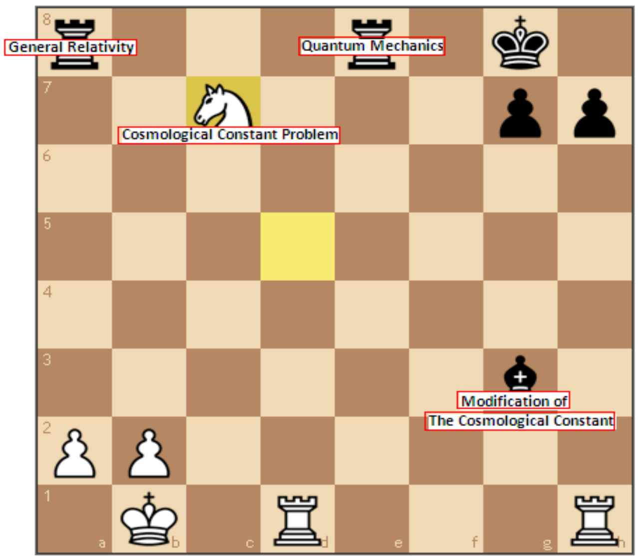
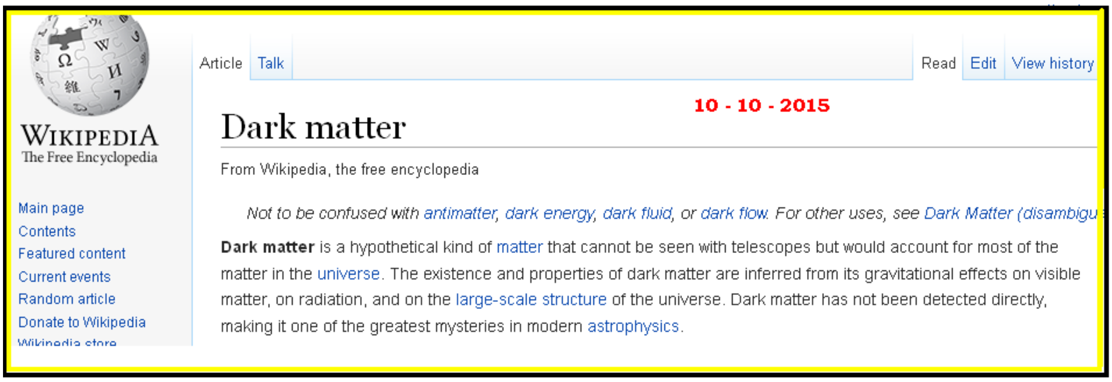
This independence of the global geometry from the average density also cancels the need for vague and contrived concept of dark energy.



6) Dark Matter

In the standard model the existence of dark matter (which never emits nor absorbs any electromagnetic radiation) is hypothesized to account for the discrepancy between the mass of the large astronomical objects determined from their gravitational effects , and their mass as calculated from their electromagnetic effects.



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10 - 10 - 2015

Dark matter

From Wikipedia, the free encyclopedia

Not to be confused with antimatter, dark energy, dark fluid, or dark flow. For other uses, see Dark Matter (disambigu

Dark matter is a hypothetical kind of matter that cannot be seen with telescopes but would account for most of the matter in the universe. The existence and properties of dark matter are inferred from its gravitational effects on visible matter, on radiation, and on the large-scale structure of the universe. Dark matter has not been detected directly, making it one of the greatest mysteries in modern astrophysics.

In our proposal we can explain what is interpreted in the standard model as dark matter as follows:

The field equation is:

$$G_{\mu\nu}^{region\ of\ application} - g_{\mu\nu}\Lambda = k\,T_{\mu\nu}^{region\ of\ application} - k\,T_{\mu\nu}^{backgroud} \quad (1)$$

Because the universe is not perfectly homogenous in some cases the background energy density inside and around the region of the application of the field equation may appear as something other than the density of the universe then the value of the average energy density which is subtracted from the right-hand side of the field equation should be defined according to the level of the application of the equation :

1) **Global Application :** Here the background energy density is the average density of the universe and thus the right-hand side of the equation is equal to zero and the global geometry of the universe is independent from its density:

$$G_{\mu\nu}^{universe} = g_{\mu\nu}\Lambda = \frac{constant}{(age\ of\ the\ universe)^2} \quad (2)$$

2) **Application of the Equation in a Galaxy as a Whole:** If we assume a homogenous distribution of matter in the galaxy then the background energy density is the average density of the universe and the equation is:

$$G_{\mu\nu}^{galaxy} - g_{\mu\nu}\Lambda = k\,T_{\mu\nu}^{galaxy} - k\,T_{\mu\nu}^{universe} \quad (3)$$

3) **Application of the Equation in the Scale of the stellar systems(like the application of the equation in our solar system) :** In this scale the density of the galaxy does not appear as a background for such small systems and the star appears as located in empty universe.

$$G_{\mu\nu}^{near\ or\ inside\ star} - g_{\mu\nu}\Lambda = k\, T_{\mu\nu}^{near\ (T_{\mu\nu}=0)\ or\ inside\ star} \quad (4)$$

4) **Application of the Equation in the Empty Space in the Scale of the Movement of the Stars inside the Galaxy :** Here the background density of the space is the density of the galaxy .

$$G_{\mu\nu}^{empty\ space} - g_{\mu\nu}\Lambda = k\, T_{\mu\nu}^{empty\ space} - k\, T_{\mu\nu}^{galaxy}$$

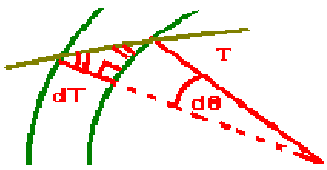
$$G_{\mu\nu}^{empty\ space\ inside\ galaxy} - g_{\mu\nu}\Lambda = -\ k\, T_{\mu\nu}^{galaxy} \quad (5)$$

It is this property of space(shown in equation (5)) of being equivalent to having negative density which appears in this scale that generates what is interpreted as dark matter in the standard model that is because according to the field equation (1)when an astronomical object is found in such a space its geometrical (gravitational) affects will increase (more than its effect if it were embedded in a space of zero or positive density) . Both the source of the gravitational field (group of stars in the center of the galaxy) and the gravitating object (a star) appear as having more than their real masses because of the negative background density which appears in this level of application of the field equation. This also explains why we can only detect (what is interpreted as) dark matter in the scale of the rotation of stars inside the galaxy but not in local observation near the stars (such as our solar system) .

7) Cosmological Redshift

As a result of the relation between space and time offered by the proposed model : The world line of light (c = 1) as it travel through the 4-dimensional space-time between the source of light and the observer is a logarithmic spiral (tends to straight line in large values of the age of the universe) this is because it keeps making an angle (Π / 4) with the 3-dimensional surface in every time because the speed is equal to the tangent of this angle.

Thus the relation between the time of emission (T*e*) and the time of observation (T*o*) and the angle between the world lines of the observer and the source (ɵ) can be obtained as follows :



We have : (*d*T = T *d*ɵ) then by integration (from T = T*e* to T = T*o*) we arrive at the important result:

T*o* = T*e* (e^ɵ)

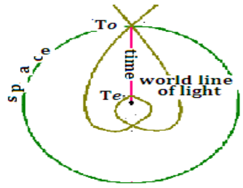
The red-shift (z) resulted from this relation between the time of emission and the time of observation is :

z = (e^ɵ) - 1

Standard Model	Proposed Model
WIKIPEDIA a enciclopedia libre cosmological redshift, which is due to the expansion of the universe **Accelerating universe** To learn about the rate of expansion of the universe we look at the magnitude-redshift relationship of astronomical objects using standard candles, or . . . 2 Sep. 2015	This relation { $z = (e^\theta) - 1$ } agrees with Hubble's law and can also be used to explain red-shift data claimed to be results of accelerated expansion (which is impossible according to this model) and thus introduce another source for red-shift other than movement and gravitational field.

8) Horizon Problem

The problem with the standard cosmological model that different regions of the universe have not contacted each other (according to the standard model) but have the same physical properties is known as the horizon problem . The cosmic background radiation which fills the space between galaxies is precisely the same everywhere.

Standard Model	Proposed Model
WIKIPEDIA a enciclopedia libre **Horizon problem** Two theories that attempt to solve the horizon problem are the theory of cosmic inflation and variable speed of light 2 Sep. 2015	This model provides a simple explanation to this homogeneity. According to the equation of the world line of light from this model $To = Te (e ^ \theta)$ all the radiation emitted from a source at $T = To (e ^ {-n \Pi})$, reaches the same source at $T = To$. 

9) The Scale Problem

Another problem with the standard model is that it contains the paradoxical restriction that it fails to fit the similar universes with different scales.

Let there be a universe with critical density (density parameter $\Omega = 1$). Now , let there be a powerful designer who want to create a small prototype of this universe.

It can be seen now that the requirements of general geometrical and dynamical similarities which imply that all intensive quantities such as the density must be the same in the real universe and the prototype , contradict the requirement that the prototype density is critical because according to the equations of the standard model the critical density depends on Hubble's distance which is different between the real universe and the

prototype as required by geometrical similarity. This is a very remarkable result. It tells us that either the existence of this prototype is impossible or there is an error in our equations.

As for the first possibility , although cannot be excluded logically it lacks explanation , and can be excluded if we assume that the size prototype is made so large to isolate any doubts about different behavior of different sizes of the same universe due to elementary structure of mater . So to allow for this prototype to work , we must make some change in our equations which is done in the proposed model by the addition of the average density of the universe to the field equation.

10) Cosmological Thermodynamics

In the Standard Cosmological Model the *first law of thermodynamics* is applied in the whole space exactly as it is applied in ordinary piston or a balloon.

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Article Talk

7 Sep. 2015

Thermodynamics of the universe

From Wikipedia, the free encyclopedia

Energy density in the expanding universe [edit]

If the universe is expanding adiabatically then it will satisfy the first law of thermodynamics:

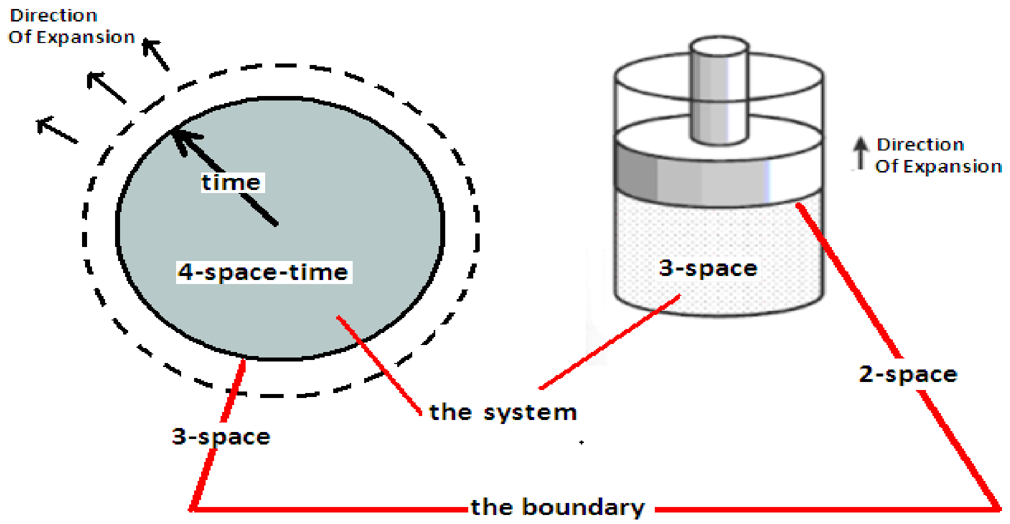
$$0 = dQ = dU + PdV$$

where Q is the total heat which is assumed to be constant, U is the internal energy of the matter and radiation in the universe, P is the pressure and V the volume.

However there is an essential difference between the two processes .. because in the case of the expansion of a piston (or a balloon) the expansion occurs in the direction of the force of the pressure on the expanding boundary of the system , it is on this boundary only the pressure has a specific direction (outwards from the system). Also we should notice that we have a three-dimensional system with two-dimensional well-defined boundary.

But take for example an expanding universe with a density parameter greater than one which is , according to the standard cosmological model , positively curved and can be thought of as a three-dimensional hyper-sphere . We can easily notice many of essential differences . firstly, we are faced with the important question " what are the boundaries of this system ?" but for the spherical shape ,the answer must be either " there is no boundary" which represents an essential difference from our first system or " the boundary is the system itself " which also leads to essential differences because on one side it can be seen that there is no force of pressure on the direction of the expansion of this boundary because all these forces lies on the 3-hyper-surface of this boundary while the direction of the expansion of this boundary is radial , on the other side the unification of the system and the boundary means that they have the same number of dimensions which is also essentially different from what is said about the ordinary system of the piston or the balloon .

In the proposed model there can be found a conservation law corresponding to the first law of thermodynamics without the problem mentioned above. The universe at any cosmological time can be thought of as a system of 4-dimensional volume and expanding boundary of this system is the spherical 3-hyperspace .



Here we find the clear analogy between the expansion of the universe and the expansion of the piston , the difference is only in the number of dimensions which is not essential and cannot be expected to restrict the application of the same laws.

In our proposed model the quantity which corresponds the pressure in the piston is the pressure which applied in the direction of expansion which is the time. This quantity is the density of the universe. Thus it turns out that the correct analogy of the first law of thermodynamics in cosmology involves the density rather than the pressure (which is the law of conservation of matter and energy) and the system should be thought of as all the space-time from the beginning of the universe to the moment of the application of the law.

Conclusion

The most simple and attractive shape of the universe of radial time and spherical 3-space is not far from the imagination of physicists but it is wrongly excluded for mainly for two false reasons. The first one is that they thought that it contradicts the field equation because for such shape the global curvature depends only on the age of the universe and independent from the average density. But we can remove this problem easily by the subtraction of the average density from the right-hand side of the equation. The second false reason is that the universe with radial time predicts only steady expansion of the space and doesn't allow for accelerated expansion , this is true but the red-shift which is attributed to the acceleration can be explained and shown to be a result of this shape.