GRAVITY CAN BE OBSERVED IN THE ABSENCE OF CURVED SPACETIME, THUS CURVED SPACETIME IS NOT RESPONCIBLE FOR GRAVITY

Mr Casey Ray McMahon
caseyraymcmahon@yahoo.com.au

ABSTRACT

The principle postulate of general relativity appears to be that curved space or curved spacetime is gravitational, in that mass curves the spacetime around it, and that this curved spacetime acts on mass in a manner we call gravity. Here, I use the theory of special relativity to show that curved spacetime can be non-gravitational, by showing that curve-linear space or curved spacetime can be observed without exerting a gravitational force on mass to induce motion- as well as showing gravity can be observed without spacetime curvature. This is done using the principles of special relativity in accordance with Einstein to satisfy the reader, using a gravitational equivalence model. Curved spacetime may appear to affect the apparent relative position and dimensions of a mass, as well as the relative time experienced by a mass, but it does not exert gravitational force (gravity) on mass. Thus, this paper explains why there appears to be more mass in the universe than gravity to account for it, because gravity is not the resultant of the curvature of spacetime on mass, thus the "dark matter" and "dark energy" we are looking for to explain this excess gravity doesn't exist.

Council for Innovative Research

Peer Review Research Publishing System

Journal: JOURNAL OF ADVANCES IN PHYSICS

Vol.8, No.1

www.cirjap.com, japeditor@gmail.com

INTRODUCTION

First, I will present a gravitational equivalence model, just as Einstein did to explain his general theory of relativity, to satisfy the reader. In my gravitational equivalence model, I will show how curved spacetime is not directly responsible for the force of gravity, in that curved spacetime can be non- gravitational. Thus, curved space can exist in the presence of gravity and in the absence of gravity, and gravity can exist without curved spacetime- thus curved spacetime in itself, or spacetime in general, has nothing to do with gravity. Again, to satisfy the reader, I use Einsteins own special relativity theory to achieve this.

EQUIVALENCE MODEL

Imagine two Observers, Observers A and B who are in a zero gravity environment. Observer B rotates around Observer A in a confined space, at constant velocity near light speed. As a result, he experiences centrifugal force as in figure 1. Observer B experiences two components of velocity (an inward and tangential component), which when considered together, result in a circular constant resultant velocity. Observer B achieved this with a propulsion system built into his “confined space”. As a result of this, Observer B experiences a centrifugal force that behaves as a gravitational equivalent. Observer A does not experience a centrifugal force, and as a result is floating freely in his confined space. Observer A has no propulsion system built into his confined space. Refer to figure 1 below.

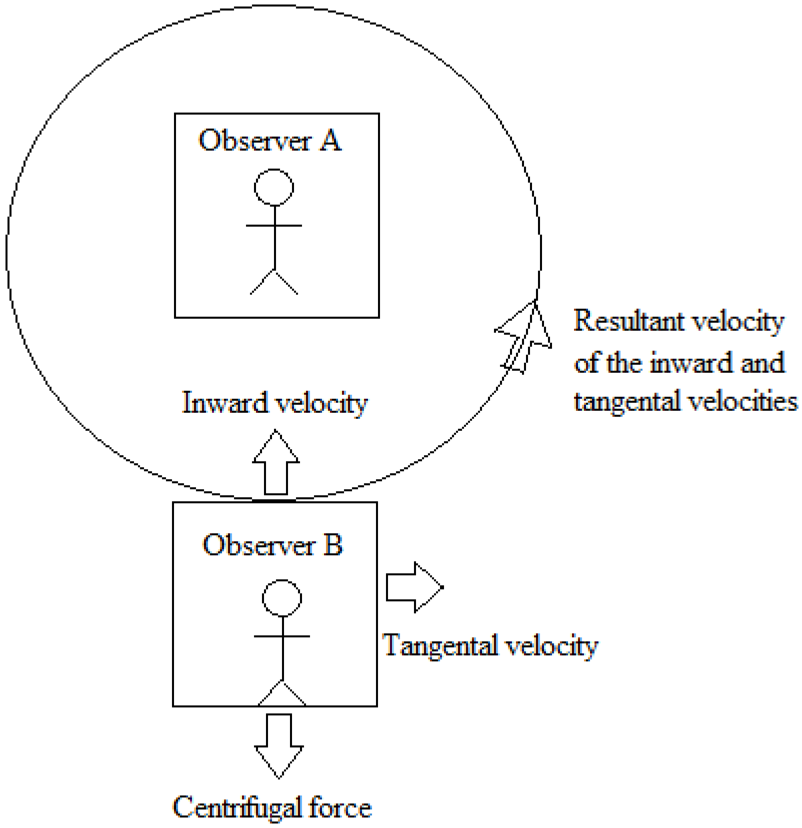

Figure 1: Gravitational equivalence model, from Observer A’s frame of reference.

Here, Observer A is floating freely, and Observer B, who has a propulsion system built into his enclosed space, is orbiting Observer A at constant velocity. As a result, Observer B experiences centrifugal force, while Observer A does not.

Now, let’s consider special relativity in this scenario. Refer to figure 2 below.

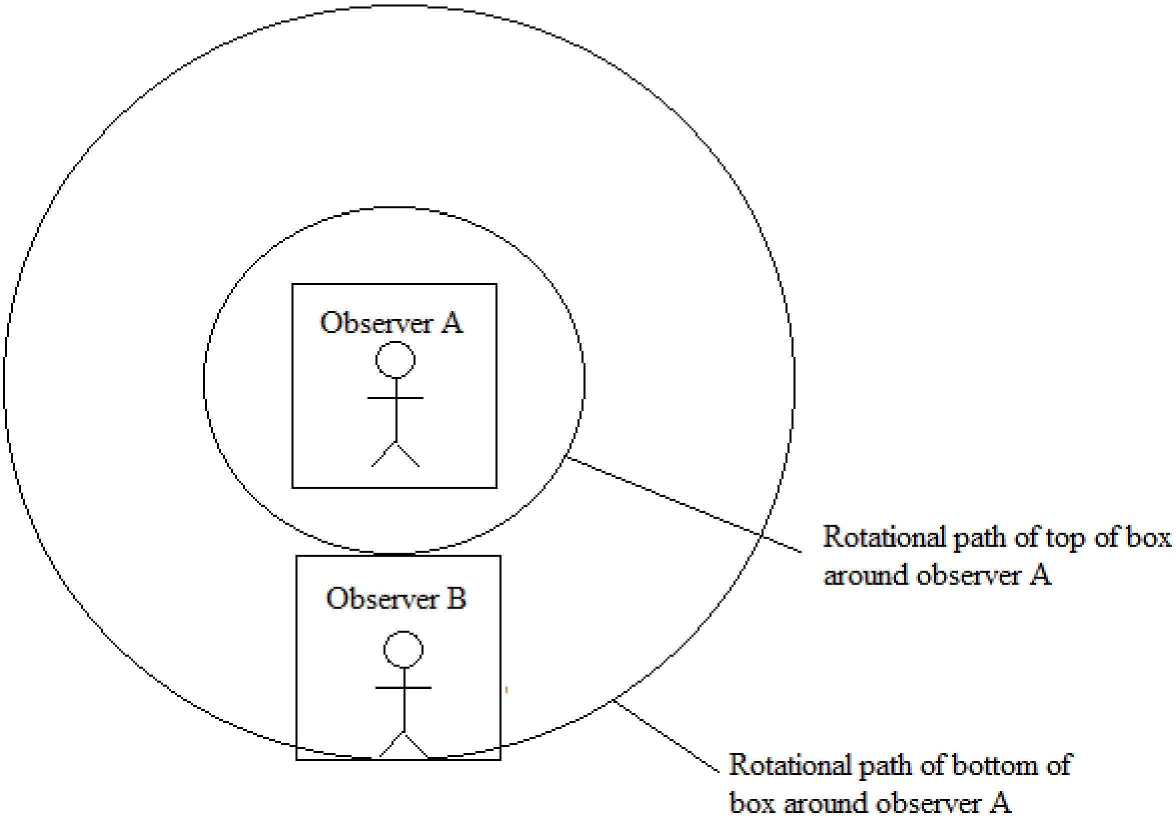

Figure 2: Relative rotational paths.

The rotational paths of the confined box space traversed by Observer B relative to Observer A.

From figure 2, notice that the bottom of the box containing Observer B travels a longer distance than the top of the box containing Observer B when rotating around Observer A. Since the box moves as a single unit, we can say from Observer B's point of view, the top of his box and bottom of his box (containing Observer B) cover their full rotational distances in the same amount of time. Since Speed = distance/time, the bottom of the box must have a higher speed than the top, as the bottom of the box travels a longer distance in the same time as the top from Observer B's point of view.

Considering special relativity, length contraction occurs according to the equation:

$$L' = L[(1-v^2/c^2)^{0.5}] \quad \text{.......... Equation (1}$$

Where:

L' = Observed length of moving system (as seen from the stationary system)

L = Observed length of stationary system (as seen from the stationary system)

v = velocity of moving system (as seen from the stationary system)

c = speed of light

Since the bottom of the box has a higher velocity than the top of the box, and we are dealing with velocities close to light, if we apply equation 1, then Observer A will Observe Observer B as in figure 3.

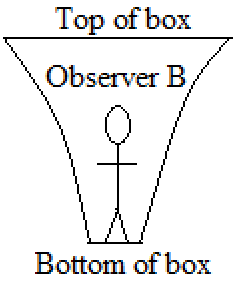

Figure 3: Length contraction of Observer B as observed by Observer A.

The length contraction effect from equation 1causes the bottom of the box to appear more compressed than the top. Because of the nature of equation 1, the sides of the box appear curved, thus the spacetime within the box containing observer B appears curved relative to observer A.

As we can see from figure 3, the spacetime within the box containing Observer B appears curved relative to Observer A (because of length contraction in special relativity). Thus, the spacetime within the box containing Observer B appears curved relative to Observer A. This must also mean another important thing from Einsteins general relativity theory which we must prove: Let’s call it postulate A.

Postulate A):

From Einsteins general relativity theory, if curved spacetime is observed, then it should appear gravitational.

Now, let’s try to verify postulate A above.

Postulate A verification:

Both Observer A and B agree that Observer B is experiencing a centrifugal force that behaves as a gravitational equivalent. As a result, Observer B is pulled down to the bottom of his confined space. Since under relativity, mathematically mass is considered to increase with observed velocity, we could consider centrifugal force as presented in equation 2.

$$\text{Centrifugal force (F)} = \frac{M V^2}{r\sqrt{1 - \frac{V^2}{C^2}}}$$

………. Equation (2

Where:

F = Centrifugal force considering relativity

V = Observed relative tangential velocity

M = Rest Mass

r = Radius of rotation

c = The speed of light

We also know from equation 2 that:

As r increases, centrifugal force decreases

As V increases, centrifugal force increases

Since the velocity term in the numerator is squared, and the Lorenz factor $((1-v^2/c^2)^{0.5})$ increases the value of F as v increases, this should overcome the fact that as r increases centrifugal force decreases. The overall result being that for Observer B, the centrifugal force increases the closer you are to the bottom of the box Observer B occupies. Gravity behaves the same way- it increases as you move in the direction it is acting.

Thus, we consider the centrifugal force as a gravitational equivalent.

Thus, from Observer A's point of view, Observer B is in curved spacetime as in figure 3, thus expects to see a gravitational force acting on Observer B. Observer A, having seen this curved spacetime around Observer B, does see a force acting on Observer B which pulls him to the floor of his box, and assumes that this force is gravitational. Thus, Observer A is satisfied with Einsteins general theory of relativity upon which postulate A is based, and agrees that curved spacetime is gravitational- in that curved space tells mass how to move.

However, does Observer B agree with Postulate A and Einsteins general theory of relativity? Lets see.

From Observer B's point of view, or frame of reference, Observer B "appears" stationary and Observer A "appears" to be the one that is moving, even though Observer B is actually the one moving through space. Refer to figure 4 below.

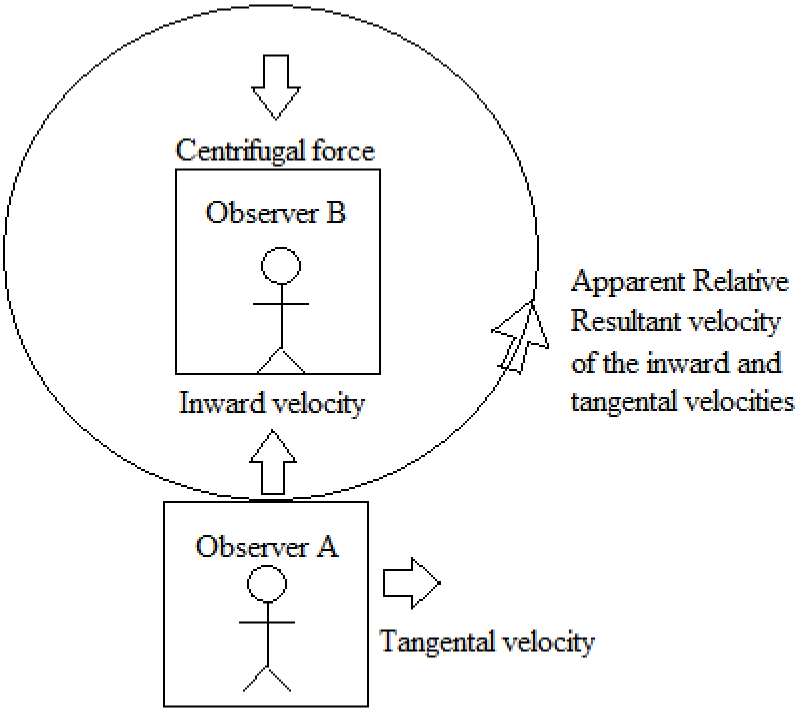

Figure 4: Gravitational equivalence model, from Observer B's frame of reference.

Relative to Observer B, it looks like Observer A is the one that is moving, despite the fact that Observer A is not actually moving at all. Note that Observer B still feels the centrifugal force described before, as he has a propulsion system. Observer A does not feel this force and is floating freely as described in figure 1.

If we apply equation 1, we see that the spacetime occupied by Observer A appears curved relative to Observer B's frame of reference, as in figure 5 below.

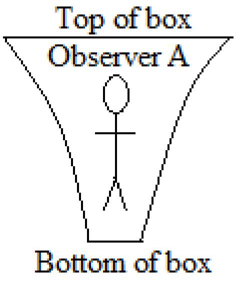

Figure 5: Length contraction of Observer A as observed by Observer B..

The length contraction effect from equation 1causes the bottom of the box to appear more compressed than the top. Because of the nature of equation 1, the sides of the box appear curved, thus the spacetime within the box containing Observer A appears curved relative to Observer B. Note: Observer A floats freely.

Thus, When Observer B observes Observer A, he notices that from his frame of reference, the spacetime occupied by Observer A is curved as in figure 5. Thus, Observer B expects to see gravitational force acting on Observer A in accordance with Einsteins general theory of relativity.

However, despite observing curved spacetime around Observer A, Observer B does not observe force acting on Observer A that could be described as gravitational. Observer A appears to be floating freely in his box, and is not pulled downwards or in any direction within his enclosed space or box. As a result, Observer B says he observes curved spacetime around Observer A, but no gravity. However, Observer B does not observe curved spacetime within his own reference frame, but he does observe a force he equates with gravity in his own reference frame. Thus, Observer B disagrees with Einstein, and states that curved spacetime is not gravitational. Thus curvature in spacetime is not required for the existence of gravity.

So, if curved spacetime has nothing to do with gravity, this at least explains why there appears to be more gravity in the universe than mass to account for it, as under the postulate of general relativity, it is assumed that mass curves spacetime around it, which is gravitational. Thus, the “dark matter” and “dark energy” physics researchers are trying to find to explain this excess gravity doesn’t exist.

This paper has shown that gravity is not simply generated by the effect of the presence of spacetime curvature on mass, Gravity is therefore something else.

I present a postulate for what gravity is and how to produce it in the paper: McMahon, C.R.: Generating gravity and time. The general science journal. (2015) [1]

REFERENCES

[1] McMahon, C.R, 2015. Generating gravity and time. The general science journal.

Author’ biography with Photo

As of the year 2015, the Author is a holder of a Science degree with honours, as well as a Mechanical engineering degree with honours. He enjoys theoretical sciences and is a frequent publisher of theoretical works in the general science journal, available online.