Newton Vs. Einstein

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Abstract:

Could Newton's gravitational law be reconciled with Einstein's general relativity?

I claim that it is possible to reconcile both theories via the frame-dragging of space by a rotating celestial body.

Newton's gravitational law describes gravity as the force exerted between two bodies. The force is dependent on the masses of the two bodies and the distance between the centers of the two bodies. The formula is: $F = \frac{G \cdot M_1 \cdot M_2}{R^2}$ and was proven to be valid and accurate in our solar system. It is used in calculating the motion of the planets and trajectories of spacecraft being sent from Earth to Mars.

On the other hand, some observations cannot be explained by Newton's law for example the precession of Mercury, bending of light by massive celestial bodies, or the dynamics near neutron stars or black holes. Einstein's GR explains these observations quite accurately. Einstein explained gravity as a distortion of the fabric of spacetime. The trajectory of a small celestial body will be along the geodesics in space created by a bigger body.

The question now is how two theories that are based on different assumptions and were proven to be correct can be reconciled?

This can be explained by the phenomenon of frame dragging of space around a rotating celestial body. The rotational frame-dragging effect was first described by Lens-Thirring based on GR. Frame dragging is also a result of the solution of rotating Kerr black hole.

I claim that Newton's law is correct, except that the distance R between the two bodies should be replaced by the geodesic length derived from general relativity. The geodesic length $L_{geodesic}$ can be calculated using GR. See Frame dragging. Newton was not aware of the fact that all celestial bodies are spinning and drag space around them. Therefore, the modified equation should be:

$$F = \frac{G \cdot M_1 \cdot M_2}{L_{geodesic}{}^2}$$

A schematic figure of how space is dragged around a spinning body is given in Fig 1. Space is dragged symmetrically around the spinning body axis. It comprises a thin disk located on the equatorial plane of the body and two spirals located on the axis of rotation. I will focus on the frame-dragging on the equatorial plane because celestial bodies rotate on this plane.

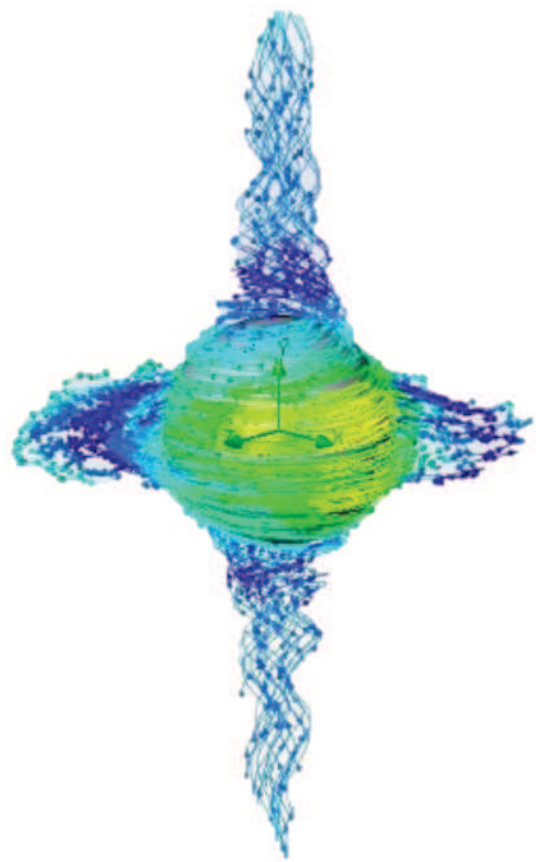


Figure 1- dragged space around a spinning body

The equation of frame dragging in the equatorial plane of a celestial body is given by:

$$\Omega(r) = \frac{R_H \cdot \alpha \cdot C}{r^3 + \alpha^2 \cdot r + R_H \cdot \alpha^2} \qquad \text{....Angular velocity}$$

Where:

$$G = 6.67 \cdot 10^{-11} \cdot \frac{m^3}{kg \cdot s} \text{.....Gravitational constant}$$

$$c = 2.9979 \cdot 10^8 \cdot \frac{m}{s} \text{.....Light velocity}$$

$R_H = \frac{2 \cdot G \cdot M}{C^2}$..... Schwarzschild radius

$m_{neutron} = 1.674927 \cdot 10^{-27} \cdot kg$.....Neutron's mass

$R_{neutron} = 0.8 \cdot 10^{-13} \cdot cm$.....Neutron's radius

$\hbar = 1.054571 \cdot 10^{-34} \cdot J \cdot s$.....Reduced Planck constant

$J = \hbar \cdot \left(\frac{M}{m_{neutron}} \right)^{\frac{3}{2}}$......Angular momnetum

Note: The equation of angular momentum is according to The primeval Hadron hypothesis.

$\alpha = \frac{J}{M \cdot C}$....Constant

To verify the hypothesis three examples are given:

1) Earth motion around the Sun- with a detailed description.

2) Motion of a body around a neutron star. – Final results.

3) Motion of a body around a black hole. – Final results.

1. Earth motion around the Sun

Given:

$M_{sun} = 1.99 \cdot 10^{30} \cdot kg$.....Sun mass

$R_{sun} = 696342 \cdot km$.....Radius of Sun

$T_{sun} = 27 \cdot day$.....Spin of Sun

$\mathrm{R}_{earth\_sun} = 149 \cdot 10^{6} \cdot km$.....Sun-Earth distance

$T_{earth\_sun} = 1 \cdot yr$.....Time of Earth rotation around Sun

$$J_{sun} = \hbar \cdot \left(\frac{M_{sun}}{m_{neutron}} \right)^{\frac{3}{2}} = 1.327 \cdot 10^{42} J \cdot s$$.....Angular momentum of Sun

according to http://adsabs.harvard.edu/full/1980Ap%26SS..69..339M

(Note: J_{sun} calcuation of the sun shpere is:

$$J_{sun\_sphere} = \frac{2}{5} \cdot M_{sun} \cdot R_{sun}^2 \cdot \frac{2 \cdot \pi}{T_{sun}} = 1.03958 \cdot 10^{42} J \cdot s$$......Angular momentum of Sun sphere according to $J_{sun} = I \cdot \omega$

There is a difference ~22% between the two results of J_{sun}. I claim that this difference is the angular momentum of draged space.)

$$\alpha_{sun} = \frac{J_{sun}}{M_{sun} \cdot C} = 2.2439 \cdot km$$

$$R_{H\_sun} = \frac{2 \cdot G \cdot M_{sun}}{C^2} = 2.954 \cdot \mathrm{km}$$..... Schwarzschild radius of Sun

$$\Omega(r) = \frac{R_{H\_sun} \cdot \alpha_{sun} \cdot C}{r^3 + \alpha_{sun}{}^2 \cdot r + R_{H\_\mathrm{sun}} \cdot \alpha_{sun}{}^2}$$ ....Angular velocity around the Sun

$$\theta(r) = \Omega(r) \cdot T_{earth} \cdot \frac{r}{R_{earth\_sun}}$$ ....Rotation angle around the Sun

The two following figures show the distance from Earth to Sun. From Fig.1, it seems that the geodesic length is a straight-line connecting Sun and Earth. However, a closer examination in Fig 2 shows that Newton's law is a very good approximation. When $\theta(r)$ is scaled up by a factor of 10^8 it is shown that the straight-line is a spiral. The spiral becomes evident near the Sun.

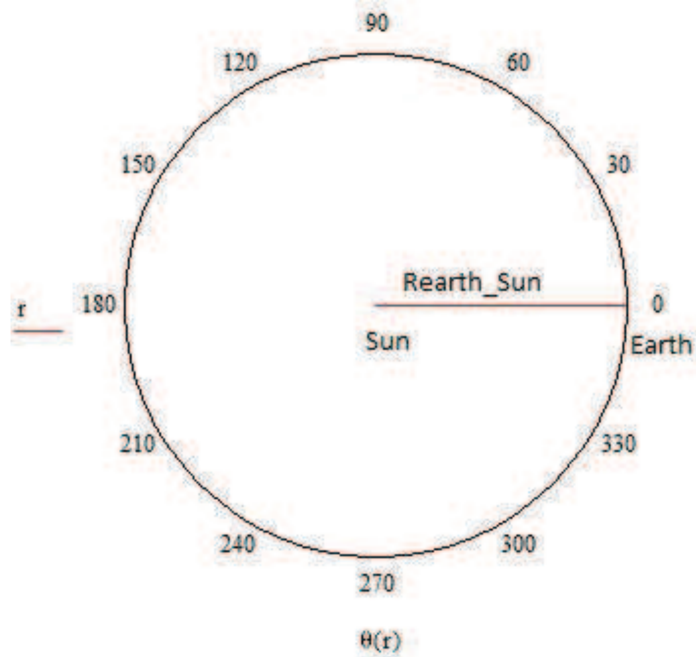


Fig. 2- Newton's law

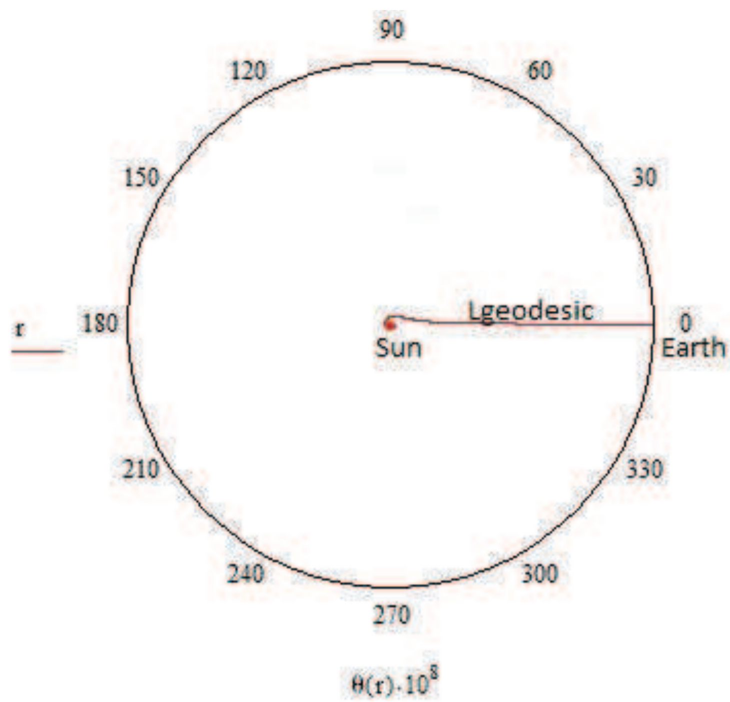


Fig. 3- Corrected Newton's law using Einstein geodesic

Finding the length of a geodesic $L_{geodesic}$ is done by using the formula of spiral length:

$$L_{geodesic} = \int_{R_{sun}}^{R_{earth\_sun}} \sqrt{\left[1+\left(\tfrac{d}{dr}\left(r\cdot\Omega(r)\cdot T_{earth}\right)\right)^2\right]}\cdot \mathrm{dr} \qquad \text{....Length of geodesic Earth to Sun}$$

And the result is $\dfrac{L_{geodesic}}{R_{earth\_sun}} \cong 1$, meaning that Newton's approximation is very good.

2) Motion of a body around a neutron star. – Final results.

The examination is done for a body orbiting, at a distance of 40km, a neutron star PSR J1748−2446ad.

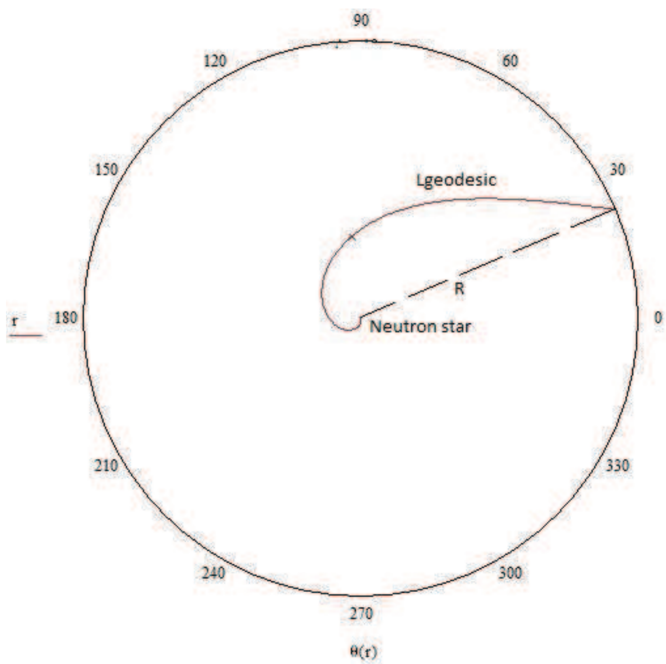
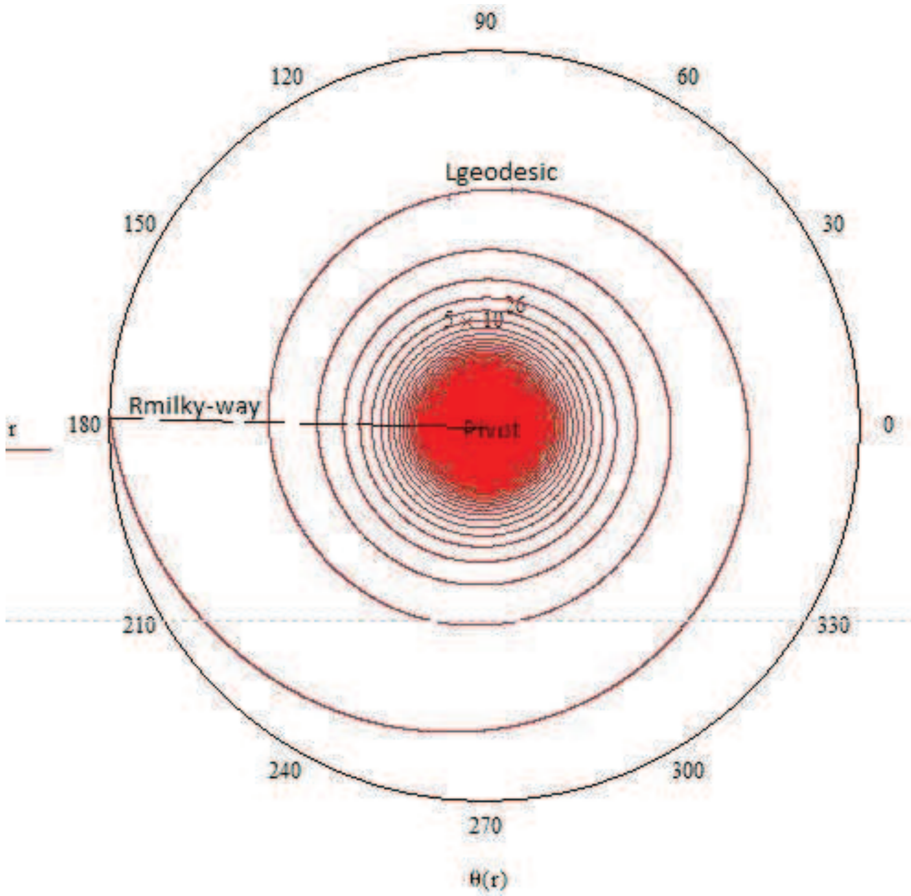


Fig. 4- Newton's distance R vs. Einstein's geodesic

The ratio is: $\dfrac{L_{geodesic}}{R} = 1.6$

3) Motion of a body around a black hole. – Final results.

This examination relates to a black hole I designate the Pivot. I claim that the Pivot is located at the center of our Universe and all visible matter is orbiting it. The Figure shows the geodesic of the Milky Way - Pivot. Details of the theory are in [The structure of the Pivot Universe]



The ratio is: $\frac{L_{geodesic}}{R_{milky\_way}} = 8 \cdot 10^3$