232(1): The Correct Force Law for a Precessing Ellipse

The force is defined from Lagrangian dynamics as:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \frac{1}{r} = -\frac{mr^2}{L^2} F \quad -(1)$$

where m is mass and L is angular momentum. The precessing ellipse is defined by:

$$r = \frac{\alpha}{1+\epsilon\cos(x\theta)} \quad -(2)$$

for small x. As x becomes larger eq. (2) gives fractal orbits.

By differentiation:

$$\frac{d}{d\theta}\left(\frac{1}{r}\right) = -\frac{x\epsilon}{\alpha}\sin(x\theta) \quad -(3)$$

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) = -\frac{x^2\epsilon}{\alpha}\cos(x\theta) \quad -(4)$$

Using eqs. (1), (2) and (4):

$$-\frac{x^2}{\alpha}\left(\frac{\alpha}{r} - 1\right) + \frac{1}{r} = -\frac{mr^2}{L^2} F \quad -(5)$$

i.e.

$$F = -\frac{L^2 x^2}{mr^2\alpha} + \frac{L^2}{mr^3}\left(x^2 - 1\right) \quad -(6)$$

). This is not the force law of Einsteinian general relativity. The latter is an incorrect theory:

Using eq. (6) in eq. (1):

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right)+\frac{1}{r}=-\frac{mr^2}{L^2}\left(\frac{L^2}{mr^2}\frac{x^2}{\alpha}\left(\frac{\alpha}{r}-1\right)-\frac{L^2}{mr^3}\right)$$

$$=-\frac{x^2}{\alpha}\left(\frac{\alpha}{r}-1\right)+\frac{1}{r}$$

$$=\frac{x^2}{\alpha}-\frac{x^2}{r}+\frac{1}{r} \quad -(7)$$

So:

$$\boxed{\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right)+\frac{x^2}{r}=\frac{x^2}{\alpha}} \quad -(8)$$

On the other hand, Einsteinian general relativity (EGR) produces:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right)+\frac{1}{r}=A+\frac{B}{r^2} \quad -(9)$$

where A and B are constants. Eq. (8) is compatible with eq (2) but eq. (9) is not.

This is a clear refutation of EGR.

3)

If eq. (9) is integrated numerically it will not produce eq. (2). With contemporary computers it is quite simple to integrate eq. (9), but in a textbook such as Marion and Thornton an approximate function is used:

$$u = \frac{1}{r} = A(1 + \epsilon\cos\theta) + BA^2\epsilon\theta\sin\theta \quad -(10)$$
$$+ BA^2\left(1 + \frac{\epsilon^2}{2}\right) - \frac{BA^2\epsilon^2}{6}\cos 2\theta$$

This is not the equation of a precessing ellipse, and this can be shown graphically. The precessing ellipse is given by eq. (2) i.e.:

$$u = \frac{1}{r} = \frac{1}{\alpha}\left(1 + \epsilon\cos(x\theta)\right) \quad -(11)$$

to become Marion and Thornton force eq. (10) eq. (11). This is a very dubious procedure because the second two terms on the RHS of eq. (10) are just dropped. Eq. (10) is already an approximation to the correct integration of eq. (9). So it is asserted that:

$$u = \frac{1}{r} =? A(1 + \epsilon\cos\theta) + BA^2\epsilon\theta\sin\theta \quad -(12)$$

4) Now they use the further approximation:

$$1 + \epsilon \cos(\theta - AB\theta)$$
$$= 1 + \epsilon(\cos\theta \cos(AB\theta) + \sin\theta \sin(AB\theta))$$
$$\sim 1 + \epsilon\cos\theta + AB\epsilon\sin\theta \quad -(13)$$

i.e. $\cos(AB\theta) \sim 1$, $\sin(AB\theta) \sim AB\theta$ $-(14)$

This is true only if $AB\theta << 1$. $-(15)$

In this approximation:

$$\frac{1}{r} \sim \frac{1}{\alpha}\left(1 + \epsilon\cos((1 - AB)\theta)\right) \quad -(16)$$

Comparing eqs. (2) and (16):

$$\boxed{x = 1 - AB} \quad -(17)$$

The precession is:

$$\Delta\theta = 2\pi(1 - x) = 2\pi AB \quad -(18)$$

So it is very clear that EGR produces the precession "by magic".

5) The correct perihelion precession is:

$$\boxed{\Delta\theta = 2\pi\left(1 - x\right)} \quad -(19)$$

and x must be measured experimentally, it cannot be predicted.

Graphical Work

Eq. (10) can be graphed through the whole range of A and B to show that it is completely different from eq. (2).

Numerical Work

Eq. (9) can be integrated numerically for all A and B to show that it does not give a precessing ellipse.