232(2): Further Refutation of the Einsteinian General Relativity

Following upon the important results of 232(1) it has became clear that the basic equation of perihelion precession are wildly incorrect. So it is important to demonstrate this in detail, so that there is no reasonable doubt left as to the conclusion. The modification of the Newtonian gravitational force law due to Einsteinian general relativity leads to the equation (7.74) of Marion and Thornton:

$$\frac{d^2u}{d\theta^2} + u = \frac{1}{\alpha} + \delta u^2 \quad -(1)$$

where

$$\frac{1}{\alpha} = \frac{G m^2 M}{L^2}, \quad \delta = \frac{3GM}{c^2}. \quad -(2)$$

The first thing to note is that the correct equation for a precessing ellipse is:

$$\frac{d^2u}{d\theta^2} + x^2\left(u - \frac{1}{\alpha}\right) = 0 \quad -(3)$$

which is obviously not the same as eq. (1). Here:

$$u = \frac{1}{r}. \quad -(4)$$

Eq. (3) corresponds to:

$$\frac{\alpha}{r} = 1 + \epsilon \cos(x\theta) \quad -(5).$$

2) Eq. (1) on the other hand has no known solution. So it is obvious that it does not produce a precessing ellipse.

The obvious thing to do is to integrate eq. (1) numerically, and this is straightforward. Even with computers available, in 1988 Marion and Thornton chose to make an approximate solution of eq. (1). The first trial solution was chosen to be the static ellipse:

$$u_1 = \frac{1}{\alpha}\left(1 + \epsilon \cos\theta\right). \quad -(6)$$

This corresponds to: $x = 1. \quad -(7)$

They then substituted eq. (6) into the right hand side of eq. (1), giving:

$$\frac{d^2 u}{d\theta^2} + u = \frac{1}{\alpha} + \frac{\delta}{\alpha^2}\left(1 + 2\epsilon\cos\theta + \frac{\epsilon^2}{2}\left(1 + \cos 2\theta\right)\right) \quad -(8)$$

They then added a function u_p to u_1 to give the second term on the right hand side of eq. (8):

$$u_p = \frac{\delta}{\alpha^2}\left(\left(1 + \frac{\epsilon^2}{2}\right) + \epsilon\theta\sin\theta - \frac{\epsilon^2}{6}\cos 2\theta\right) - (9)$$

The first thing to notice is that this procedure does not give a solution of eq. (1), it obviously gives eq. (8), which is not eq. (1).

3) We have:

$$\frac{du_p}{d\theta} = \frac{\delta}{\alpha^2}\left(\epsilon\left(\sin\theta + \theta\cos\theta\right) + \frac{\epsilon^2}{3}\sin 2\theta\right) \quad -(10)$$

$$\frac{d^2u_p}{d\theta^2} = \frac{\delta}{\alpha^2}\left(\epsilon\left(2\cos\theta - \theta\sin\theta\right) + \frac{2\epsilon^2}{3}\cos 2\theta\right) \quad -(11)$$

so:

$$\frac{d^2u_p}{d\theta^2} + u_p = \frac{\delta}{\alpha^2}\left(1 + 2\epsilon\cos\theta + \frac{\epsilon^2}{2}\left(1+\cos 2\theta\right)\right) \quad -(12)$$

At this point, Maria and Thornton use the solution:

$$u_t = u_1 + u_p = \frac{1}{\alpha}\left(1+\epsilon\cos\theta\right) + \frac{\delta\epsilon}{\alpha^2}\theta\sin\theta \quad -(13)$$

$$+ \frac{\delta}{\alpha^2}\left(1+\frac{\epsilon^2}{2}\right) - \frac{\delta\epsilon^2}{6\alpha^2}\cos 2\theta$$

$$= \frac{1}{\alpha}\left(1+\epsilon\cos\theta\right) + \frac{\delta}{\alpha^2}\left(\left(1+\frac{\epsilon^2}{2}\right) + \epsilon\theta\sin\theta - \frac{\epsilon^2}{6}\cos 2\theta\right)$$

The plot by Dr. Horst Eckardt in 232(1) shows that this function is grossly unphysical because it gives poles and negative r.

So EGR is wildly incorrect, QED.

4) Furthermore, note that:

$$\frac{d^2 u_t}{d\theta^2} + u_t \neq \frac{1}{\alpha} + \delta u_t^2 \quad -(14)$$

because:

$$\frac{d^2 u_t}{d\theta^2} + u_t = \frac{1}{\alpha} + \frac{\delta}{\alpha^2}\left(1 + 2\epsilon\cos\theta + \frac{\epsilon^2}{2}(1+\cos 2\theta)\right) \quad -(15)$$

and

$$u_t^2 = \left(\frac{1}{\alpha}(1+\epsilon\cos\theta) + \frac{\delta}{\alpha^2}\left(\left(1+\frac{\epsilon^2}{2}\right) + \epsilon\theta\sin\theta - \frac{\epsilon^2}{6}\cos 2\theta\right)\right)^2 . \quad -(16)$$

It is obvious that the "solution" u_t is not in fact a solution at all.

So we see that the textbook treatment by Marion and Thornton is complete nonsense. It is not even a valid approximation procedure.

The next step by Marion and Thornton is a completely random assertion. It is claimed entirely without proof that the term $\frac{\delta}{\alpha^2}\left(1+\frac{\epsilon^2}{2}\right) - \frac{\delta\epsilon^2}{6\alpha^2}\cos 2\theta$ can be omitted because

5) it does not contribute to perihelion precession. However, the perihelion precession has not even been calculated, and u_t is not a solution of eq. (1). So they arrive at:

$$u_s =? \frac{1}{\alpha}\left(1 + \epsilon\cos\theta + \frac{\delta\epsilon}{\alpha}\theta\sin\theta\right) - (17)$$

but they do not check that this is physical, or if it is a solution of eq. (1).

It is obvious that u_s cannot be a solution of eq. (1) because u_t is not a solution of eq. (1).

Plotting Exercise

A plot of eq. (17) can be made by computer to investigate its properties through the complete range of α and δ and ϵ.

Check of Eq. (17)

It is randomly asserted by Maria and Thornton that eq. (17) is a solution of eq. (1). This claim can be checked directly as follows. It is claimed that:

$$\frac{d^2 u_s}{d\theta^2} + u_s = \frac{1}{\alpha} + \delta u_s^2 - (18)$$

6) We have:

$$\frac{du_s}{d\theta} = -\frac{\epsilon}{\alpha}\sin\theta + \frac{\delta\epsilon}{\alpha^2}\left(\sin\theta + \theta\cos\theta\right), \quad -(19)$$

$$\frac{d^2u_s}{d\theta^2} = -\frac{\epsilon}{\alpha}\cos\theta + \frac{\delta\epsilon}{\alpha^2}\left(\cos\theta + \cos\theta - \theta\sin\theta\right)$$

$$= \frac{\epsilon}{\alpha}\left(\frac{\delta}{\alpha}\left(2\cos\theta - \theta\sin\theta\right) - \cos\theta\right) \quad -(20)$$

$$u_s = \frac{1}{\alpha}\left(1 + \epsilon\cos\theta + \frac{\delta\epsilon}{\alpha}\theta\sin\theta\right) \quad -(21)$$

So:

$$\frac{d^2u_s}{d\theta^2} + u_s = \frac{1}{\alpha} + \frac{\delta\epsilon}{\alpha^2}\left(\theta\sin\theta + 2\cos\theta - \theta\sin\theta\right)$$

$$= \frac{1}{\alpha} + \frac{2\delta\epsilon}{\alpha^2}\cos\theta \quad -(22)$$

However:

$$\delta u_s^2 = \frac{\delta}{\alpha}\left(1 + \epsilon\cos\theta + \frac{\delta\epsilon}{\alpha}\theta\sin\theta\right)^2$$

$$\neq 2\frac{\delta\epsilon}{\alpha^2}\cos\theta \quad -(23)$$

7) It is seen that u_s is not even approximately correct. The reason for this is that u_t is not even approximately correct. So the method used by Maria and Thomta is total nonsense. Presumably it is based on methods used routinely in general relativity.

For the sake of argument only, it is noted that the next step by Maria and Thomta is to use:

$$1 + \epsilon \cos(x\theta) = 1 + \epsilon\left(\cos\theta \cos\left(\frac{\delta\theta}{\alpha}\right) + \sin\theta \sin\left(\frac{\delta\theta}{\alpha}\right)\right) \quad -(24)$$

where

$$x := 1 - \frac{\delta}{\alpha}. \quad -(25)$$

They then assume:

$$\frac{\delta\theta}{\alpha} \ll 1. \quad -(26)$$

It is not clear why this is true in general. Here:

$$\frac{\delta}{\alpha} = \frac{3GM}{c^2} \cdot \frac{Gm^2M}{L^2} = \frac{3G^2m^2M^2}{c^2L^2} \quad -(27)$$

For the earth sun system:

$G = 6.67384(80) \times 10^{-11}\ N m^2 kg^{-2}$

$M = 1.9891 \times 10^{30}\ kg$

$m = 5.97219 \times 10^{24}\ kg$

8) $L = mvr = 2.663 \times 10^{40}\ kg^2 m^2 s^{-1}$

$c = 2.998 \times 10^8\ ms^{-1}$

So:

$$\frac{\delta}{d} = 3 \times \left(\frac{6.673^2 \times 5.972^2 \times 1.989^2}{2.998^2 \times 2.663^2} \right) \times 10^{-38} \quad -(28)$$

so it is very small in this particular case.

However, θ is in general unbounded, so although δ / d is very small, $\delta\theta / d$ may become greater than unity, because θ has no upper bound and $\delta\theta / d$ has no upper bound.

If the assumption (26) is accepted just for the sake of argument, then:

$$\cos\left(\frac{\delta\theta}{d}\right) \sim 1, \quad \sin\left(\frac{\delta\theta}{d}\right) \sim \frac{\delta\theta}{d} \quad -(29)$$

and:

$$1 + \epsilon \cos\theta + \frac{\delta\epsilon}{d}\theta \sin\theta \sim 1 + \epsilon \cos\left(\theta\left(1 - \frac{\delta}{d}\right)\right)$$

$$= 1 + \epsilon \cos(x\theta) \quad -(30)$$

where $x = 1 - \frac{\delta}{d} \quad -(31)$

1) However, if we try this method in eq. (23):

$$\delta u_s^2 = \frac{\delta}{d}\left(1 + \epsilon\cos(x\theta)\right)^2$$

$$= \frac{\delta}{d}\left(1 + 2\epsilon\cos(x\theta) + \epsilon^2\cos^2(x\theta)\right)$$

$$\neq 2\frac{\delta\epsilon}{d^2}\cos\theta \quad -(32)$$

and the solution u_s is still incorrect.

Furthermore, if we try this method for u_t, then in eq. (13):

$$u_t = \frac{1}{d}\left(1 + \epsilon\cos(x\theta)\right) + \frac{\delta}{d^2}\left(1 + \frac{\epsilon^2}{2} - \frac{\epsilon^2}{6}\cos 2\theta\right)$$

$$u_t = \frac{1}{d}\left(1 + \epsilon\cos(x\theta)\right) + \frac{\delta}{d^2}\left(1 + \frac{\epsilon^2}{6}\left(3 - \cos 2\theta\right)\right) \quad -(33)$$

Graphical Exercise

Graph eq. (33) to show that it is never a precessing ellipse.

So u_t is obviously wrong because the true equation of a precessing ellipse is

$$u = \frac{1}{d}\left(1 + \epsilon\cos(x\theta)\right) \quad -(34)$$

10) In order to be self consistent, the approximation:

$$\cos 2\theta \sim 1 \quad -(35)$$

must be used in eq. (33), so:

$$u_t \rightarrow \frac{1}{d}\left(1+\epsilon\cos(x\theta)\right)+\frac{\delta}{d^2}\left(1+\frac{\epsilon^2}{3}\right) \quad -(36)$$

if and only if:

$$x\theta \ll 1 \quad -(37)$$

This method is incorrect because $x\theta$ is not bounded above, i.e. θ can be any value, and in general:

$$x\theta \not\ll 1. \quad -(38)$$

It is possible for

$$\boxed{x\theta \longrightarrow \infty} \quad -(39)$$

Finally, in this type of theory the L^2 factor is defined by:

$$L^2 = m^2 M G a(1-\epsilon^2) \quad -(40)$$

where a is the semi major axis. Then:

$$\frac{\delta}{d} = \frac{3G^2m^2M^2}{c^2m^2MGa(1-\epsilon^2)} = \frac{3GM}{ac^2(1-\epsilon^2)} \quad -(41)$$

and

$$\frac{1}{d} = \frac{Gm^2M}{Gm^2Ma(1-\epsilon^2)}$$

11) i.e.

$$\alpha = a(1-\epsilon^2), \quad - (42)$$

and

$$\frac{1}{\alpha} = \frac{1}{a(1-\epsilon^2)}. \quad - (43)$$

So

$$\frac{\delta}{\alpha^2} = \frac{3GM}{a^2c^2(1-\epsilon^2)^2}. \quad - (44)$$

Conclusions

1) The correct equation of motion for a precessing ellipse is eq. (3), not eq. (1).

2) Both the solutions u_t and u_s used by Maria and Thornton are wildly incorrect.

3) The solution u of the EGR equation (1) must be found by direct numerical integration.

4) The assumption $\delta\theta/\alpha \ll 1$ is a false assumption because θ is not bounded above, i.e. θ can go to infinity. In the correct eq. (5), there is no limit on $x\theta$. It is never assumed that $x\theta \ll 1$.

5) The small angle approximation of eq. (1) results in:

$$x = 1 - \frac{\delta}{\alpha} \quad - (45)$$

5) If this is used in the correct eq. (3) it does not produce eq. (1), it produces:

$$\frac{d^2u}{d\theta^2} + \left(1 - \frac{\delta}{\alpha}\right)^2\left(u - \frac{1}{\alpha}\right) = 0 \quad -(46)$$

i.e.

$$\frac{d^2u}{d\theta^2} + \left(1 - \frac{\delta}{\alpha}\right)^2 u = \frac{1}{\alpha}\left(1 - \frac{\delta}{\alpha}\right)^2 \quad -(47)$$

and this is not:

$$\frac{d^2u}{d\theta^2} + u = \frac{1}{\alpha} + \delta u^2 \quad -(48)$$

6) Eqs. (1) and (3) can be the same if and only if:

$$x^2\left(u - \frac{1}{\alpha}\right) = u - \frac{1}{\alpha} - \delta u^2 \quad -(49)$$

in which case u can have only two fixed values, reductio ad absurdum.

The claims of Einsteinian general relativity are completely false.