MULTIPLE REFUTATIONS OF EINSTEINIAN GENERAL RELATIVITY.

by

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ABSTRACT

The correct Euler Lagrange equation of motion is derived for the true precessing conical section and shown to have an entirely different structure from that claimed by Einsteinian general relativity (EGR). Well known approximations to the EGR equation of motion such as that by Marion and Thornton are shown by computer to contain many errors. The EGR equation of motion is integrated numerically. It does not produce a true precessing ellipse, it produces a poorly behaved function that is unphysical and critically and unphysically dependent on initial conditions. The Wronskian method of integration of the EGR equation produces the same conclusion, EGR does not give a true precessing ellipse. It is shown by computer that several types of small perturbation of the Newtonian orbit all result in precession of the perihelion, so EGR is not uniquely defined. None of these precessions are that of a true precessing ellipse. If EGR is identified with the true precessing ellipse an absurd result is obtained. Finally light deflection due to gravitation is described with a precessing hyperbola. Previous work has shown that all orbits can be described by a precessing conical section, including those of whirlpool galaxies in which EGR fails qualitatively.

Keywords: ECE theory, multiple refutations of Einsteinian general relativity.

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1. INTRODUCTION

In previous work in this series of two hundred and thirty two papers and books to date {1 - 10} it has been shown that all known orbits can be described with a precessing conical section, including those of whirlpool galaxies. In previous work the Einsteinian general relativity (EGR) has been refuted in many ways. In this paper several simple refutations are given of EGR using only elementary linear algebra and numerical integration. The fact that the much vaunted EGR collapses under elementary scrutiny means that it is pathological science, or repeated dogma. In Section 2 it is shown that the Euler Lagrange equation of motion of a true precessing ellipse has a completely different structure from that claimed by EGR. The true equation of motion has a Newtonian type term multiplied by the square of the precession factor x. It does not contain a term from the miscalled "Schwarzschild metric" {11}. The direct numerical integration of the EGR equation of motion produces a mathematically poorly behaved function that is not a true precessing ellipse, and which is unphysical. It is critically dependent on initial conditions. If the latter are changed only slightly, the function becomes completely different. In contrast the true precessing ellipse is mathematically well behaved for all x. It is shown in Section 2 that well known approximate solutions {12} to the EGR equation of motion fail completely under scholarly scrutiny. The solutions contain poles, give negative r, contain arbitrarily discarded terms, and contain elementary errors. They cannot give a true precessing ellipse, and the claim to precision of EGR is completely false. The Wronskian method of integration gives a result that in general a first order non-linear differential equation which again does not produce a true precessing ellipse. It is found that several types of small perturbation of the Newtonian orbit results in precession of the perihelion, so EGR is not a unique theory. None of these precessions are those of a true precessing conical section. If EGR is forced to be a true precessing conical section, an absurd result is obtained. The underlying reason for these absurdities is that EGR incorrectly neglects spacetime torsion {1 - 10} in its basic geometry. It is well known that the Newtonian orbit is a true ellipse, so any precession of the perihelion must be a true precessing ellipse. Finally in Section 2 it is shown for philosophical self consistency that the phenomenon of mass deflection by gravitation can be explained straightforwardly with a true precessing hyperbola, another precessing conical section. The photon with mass is deflected in the same way as any particle with mass.

In Section 3 the computational methods used are defined, and some graphical illustrations given of the EGR refutations. The latter are easy to understand with elementary linear algebra and calculus.

2. REFUTATIONS OF EGR

In the methods used in EGR {1 - 12} the force is defined by the Euler Lagrange equation:

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

in plane polar coordinates. Here m is mass, L is the conserved total angular momentum of a mass m orbiting a mass M and F the force between m and M. If M >> m, the reduced mass is well approximated by m, as in Eq. (1). The true precessing ellipse is defined by:

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

where α is the half right latitude, ϵ is the ellipticity, and x the precession factor. The angle θ in the orbit defined by the true ellipse:

$$r=\frac{\alpha}{1+\epsilon\cos\theta} \quad -(3)$$

is simply multiplied by x. As in recent papers of this series on www.aias.us, this procedure produces many interesting results as x increases. In the solar system however x differs from unity only by factor of about 10^{-6}. From Eqs. (1) and (2) it is easily found that:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + x^2\left(\frac{1}{r} - \frac{1}{\alpha}\right) = 0 \quad - (4)$$

the corresponding Newtonian result is:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \left(\frac{1}{r} - \frac{1}{\alpha}\right) = 0. \quad - (5)$$

On the other hand, EGR produces:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \left(\frac{1}{r} - \frac{1}{\alpha}\right) - \frac{\delta}{r^2} = 0 \quad - (6)$$

where:

$$\frac{1}{\alpha} = \frac{Gm^2M}{L^2}, \quad \delta = \frac{3GM}{c^2}. \quad - (7)$$

Here G is Newton's constant and c the speed of light in a vacuum. In EGR this is assumed to be constant. It is very easy to show as follows that Eq. (6) cannot be that of the true precessing ellipse (4), and for centuries it has been thought that the precession of the perihelion is the precession of a true ellipse because the Newtonian orbit is a true ellipse. If EGR gave a true precessing ellipse as claimed for nearly a century, then:

$$\frac{1}{r} - \frac{1}{\alpha} - \frac{\delta}{r^2} = x^2\left(\frac{1}{r} - \frac{1}{\alpha}\right) \quad - (8)$$

which is a quadratic giving the result:

$$\frac{1}{r} = \frac{(1-x^2)}{2\delta}\left(1 \pm \left(1 - \frac{4\delta}{\alpha(1-x^2)}\right)^{1/2}\right). \quad - (9)$$

This means that EGR is a true precessing ellipse only for two values of r. These are evaluated by computer in Section 3. This is an absurd result. EGR must give a precessing ellipse for all r, so EGR is refuted QED. If it were not for dogma, no one would take further notice of EGR. If x instead of r were evaluated from Eq. (8) then:

$$x^2 = 1 - \frac{\delta}{r}\left(1 - \frac{r}{\alpha}\right)^{-1} \quad -(10)$$

Using this value in Eq. (2) gives;

$$\theta = \left(1 - \frac{\delta}{r}\left(1 - \frac{r}{\alpha}\right)^{-1}\right)^{-1} \cos^{-1}\left(\frac{1}{\epsilon}\left(\frac{\alpha}{r} - 1\right)\right) \quad -(11)$$

which is a poorly behaved function with a singularity. For the true precessing ellipse, it is easy to show from Eq. (2) that:

$$\theta = \frac{1}{x} \cos^{-1}\left(\frac{1}{\epsilon}\left(\frac{\alpha}{r} - 1\right)\right), \quad -(12)$$

$$x = \text{constant}.$$

Eqs. (11) and (12) are plotted and compared directly in Section 3. The conclusion is that EGR does not give a true precessing ellipse.

When Eq. (6) is integrated numerically it gives a function that is poorly behaved mathematically. This function is described and graphed in Section 3. It is critically dependent on the choice of initial conditions, and for these reasons is an unphysical function. The EGR theory is unphysical, QED. This unphysical function gives a precession for very small perturbations δ, as in Section 3, but this precession is not the precession of the Newtonian ellipse because it is not a true precessing ellipse. A true precessing ellipse is well behaved mathematically for all values of x and all r and θ. Furthermore, it was found by numerical integration that all small perturbations of the Newtonian theory, such as :

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \left(\frac{1}{r} - \frac{1}{\alpha}\right) - \frac{A}{r^3} - \frac{B}{r^4} - \dots = 0 \quad -(13)$$

give a precession, so the EGR theory is not unique. None of these precessions are those of a true precessing ellipse. EGR is in fact a completely arbitrary theory produced by an arbitrary metric misattributed to Schwarzschild {1 - 10}. The historical fact is that on Dec. 22nd 1915 Schwarzschild refuted EGR in a letter to Einstein. In so doing he introduced a metric without a singularity. This letter is available on the internet, and easily googled up.

In order to emphasize these points the Wronskian method was used as in note 232(4) on www.aias.us to produce from the second order EGR equation (6) the first order differential equation:

$$\frac{df}{d\theta} = -\frac{\epsilon}{\alpha}\sin\theta + \frac{3GM}{c^2\epsilon}\left(\frac{1+\epsilon\cos\theta}{\sin\theta}\right)f^2. \quad -(14)$$

The Wronskian method proceeds by writing Eq. (6) as:

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

in which f is to be determined. So:

$$\frac{1}{r} = f(\theta). \quad -(16)$$

The relevant solution of this equation is:

$$\frac{1}{r} = \frac{1}{\alpha}\left(1+\epsilon\cos\theta\right) + \frac{3GM}{c^2\epsilon}\int f^2(\theta)\left(\frac{1+\epsilon\cos\theta}{\sin\theta}\right)d\theta. \quad -(17)$$

The first term is the true Newtonian ellipse, and the second term is a perturbation. In the solar system and even in systems of maximum observed perihelion precession such as binary pulsars:

$$f^2(\theta) = \frac{1}{\alpha^2}\left(1+\epsilon\cos\theta\right)^2 \quad -(18)$$

so to a very good approximation

$$x - 1 \sim 10^{-6} \quad -(19)$$

and so:

$$\frac{1}{r} \sim \frac{1}{\alpha}\left(1+\epsilon\cos\theta\right) + \frac{3GM}{c^2\epsilon\alpha^2}\int \frac{\left(1+\epsilon\cos\theta\right)^3}{\sin\theta}\,d\theta \quad -(20)$$

This is not a true precessing ellipse, QED.

Some attempts have been made {12} to solve Eq. (6) with approximations. One such attempt {12} is analysed here and shown to fail in several ways. The method proceeds by assuming that the function (3) is a good approximation. The Wronskian method discussed already gives the mathematically correct procedure and the result (20). However, the attempt made in reference (12) substitutes Eq. (3) into Eq. (6) to give:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \frac{1}{r} = \frac{1}{\alpha} = \frac{\delta}{\alpha^2}\left(1 + 2\epsilon\cos\theta + \frac{\epsilon^2}{2}\left(1+\cos 2\theta\right)\right) - (21)$$

A function $\frac{1}{r_p}$ is then added to $\frac{1}{r}$ to give the second term on the right hand side of Eq. (21). This function is {12}:

$$\frac{1}{r_p} = \frac{\delta}{\alpha^2}\left(\left(1+\frac{\epsilon^2}{2}\right) + \epsilon\theta\sin\theta - \frac{\epsilon^2}{6}\cos 2\theta\right) - (22)$$

The first objection of this paper is that the function (22) is not a solution of Eq. (6).

The function used in ref. (12) is:

$$\frac{1}{r_t} = \frac{1}{r_1} + \frac{1}{r_p} = \frac{1}{\alpha}\left(1+\epsilon\cos\theta\right) + \frac{\delta}{\alpha^2}\left(\left(1+\frac{\epsilon^2}{2}\right) + \epsilon\theta\sin\theta - \frac{\epsilon^2}{6}\cos 2\theta\right) \quad -(23)$$

but as shown in Section 3 this is poorly behaved, it has unphysical poles for example.

Furthermore, note that:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r_t}\right)+\frac{1}{r_t}-\frac{1}{\alpha}-\frac{\delta}{r_t^2}\neq 0 \quad -(24)$$

because:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r_t}\right)+\frac{1}{r_t}=\frac{1}{\alpha}+\frac{\delta}{\alpha^2}\left(1+2\epsilon\cos\theta+\frac{\epsilon^2}{2}\left(1+\cos 2\theta\right)\right)$$
$$-(25)$$

and:

$$\frac{1}{r_t^2}=\left(\frac{1}{\alpha}\left(1+\epsilon\cos\theta\right)+\frac{\delta}{\alpha^2}\left(\left(1+\frac{\epsilon^2}{2}\right)+\epsilon\theta\sin\theta-\frac{\epsilon^2}{6}\cos 2\theta\right)\right)^2 \quad -(26)$$

The "solution" $\frac{1}{r_t}$ is not a solution at all. At this point this method would be rejected objectively or scientifically were it not for adherence to the dogma that EGR is a precise theory. For the sake of argument however we describe the next stage in the dogma {12}. This is to assume that:

$$\frac{1}{r_s}=?\ \frac{1}{\alpha}\left(1+\epsilon\cos+\frac{\delta\epsilon}{\alpha}\theta\sin\theta\right) \quad -(27)$$

which means that the term:

$$\frac{1}{r_2}=\frac{\delta}{\alpha^2}\left(1+\frac{\epsilon^2}{2}\right)-\frac{\delta\epsilon^2}{6\alpha^2}\cos 2\theta \quad -(28)$$

is arbitrarily omitted. It is easy to show that $\frac{1}{r_s}$ is not a solution of:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r_s}\right)+\frac{1}{r_s}-\frac{1}{\alpha}-\frac{\delta}{r_s^2}=0 \quad -(29)$$

because:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r_s}\right) + \frac{1}{r_s} = \frac{1}{\alpha} + \frac{2\delta\epsilon}{\alpha^2}\cos\theta \quad -(30)$$

and

$$\frac{\delta}{r_s^2} = \frac{\delta}{\alpha}\left(1+\epsilon\cos\theta + \frac{\delta\epsilon}{\alpha}\theta\sin\theta\right)^2 \neq \frac{2\delta\epsilon}{\alpha^2}\cos\theta . \quad -(31)$$

It is seen that $\frac{1}{r_s}$ is not even approximately correct because $\frac{1}{r_t}$ is not even approximately correct. For the sake of argument only it is noted that the next step in this incorrect method {12} is to use:

$$1+\epsilon\cos(x\theta) = 1+\epsilon\left(\cos\theta\cos\left(\frac{\delta\theta}{\alpha}\right) + \sin\theta\sin\left(\frac{\delta\theta}{\alpha}\right)\right) \quad -(32)$$

where:

$$x = 1 - \frac{\delta}{\alpha}, \quad -(33)$$

$$\delta\theta/\alpha \ll 1. \quad -(34)$$

However, the assumption (34) is not true in general because θ is not bounded above in general, it can go to infinity. The error made is in assuming that because δ/α << 1, then $\delta\theta/\alpha$ << 1. It is then assumed incorrectly that:

$$\cos\left(\frac{\delta\theta}{\alpha}\right) \sim 1, \quad \sin\left(\frac{\delta\theta}{\alpha}\right) \sim \frac{\delta\theta}{\alpha} \quad -(35)$$

and that:

$$1+\epsilon\cos\theta + \frac{\delta\epsilon}{\alpha}\theta\sin\theta \sim 1+\epsilon\cos(x\theta). \quad -(36)$$

It is easily seen that if Eq. (36) is tried in Eq. (31) then:

$$\frac{\delta}{r_s^2} = \frac{\delta}{\alpha}\left(1+\epsilon\cos(x\theta)\right)^2 \neq \frac{2\delta\epsilon}{\alpha^2}\cos\theta \quad -(37)$$

and the approximation is plainly incorrect. Furthermore, Eq. (26) gives:

$$\frac{1}{r_k} = \frac{1}{\alpha}\left(1+\epsilon\cos(x\theta)\right) + \frac{\delta}{\alpha^2}\left(1+\frac{\epsilon^2}{6}\left(3-\cos 2\theta\right)\right) \quad -(38)$$

and this is not a true precessing ellipse. The true precessing ellipse is the first term in Eq. (38) and the addition of the second term means that it is no longer a true precessing ellipse.

This method is riddled with obvious errors, but because of dogma it is still used in a textbook such as (12). It gives a precession of:

$$\frac{\delta}{\alpha} = 1 - x = \frac{3GM}{ac^2(1-\epsilon^2)} \quad -(39)$$

where a is the semi major axis. It is claimed that this is precise, but in fact it is meaningless, because it is derived from incorrect algebra. The table in ref. (12) shows that it is in fact imprecise in the solar system, and in whirlpool galaxies fails completely. The obviously correct way to describe the precession of the perihelion is to measure x from Eq. (2) applied to the astronomical data.

To end this section the true precessing conical section (2) is applied to the deflection of a mass m by the gravitation of a mass M. This theory can be applied to the photon mass m and therefore to the deflection of light by gravitation. The deflection is measured by the angle between the asymptotes of a hyperbola:

$$\Delta\psi = 2\sin^{-1}\frac{1}{\epsilon} \quad -(40)$$

where ϵ the eccentricity of the hyperbola is:

$$\epsilon = \left(1+\frac{b^2}{a^2}\right)^{1/2} \quad -(41)$$

The Cartesian equation of the hyperbola is the well known:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad -(42)$$

and its polar equation is:

$$r = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(43)$$

where:

$$\alpha = a\left(\epsilon^2 - 1\right). \quad -(44)$$

Therefore the polar angle is defined by:

$$\cos\theta = \left(\frac{\alpha}{r} - 1\right) \sin\left(\frac{\Delta\phi}{2}\right). \quad -(45)$$

However, from the precession of the perihelion of planets, already discussed in this section, it is known that the relation between r and θ is given by Eq. (2), and all orbits must be described by this equation. It follows that in the deflection of a mass m by a mass M:

$$\cos(x\theta) = \left(\frac{\alpha}{r} - 1\right) \sin\left(\frac{\Delta\phi}{2}\right). \quad -(46)$$

If the angle of deflection is doubled then Eq. (40) becomes:

$$2\Delta\phi = 2\sin^{-1}\frac{1}{\epsilon_1} \quad -(47)$$

where:

$$\alpha_1 = a\left(\epsilon_1^2 - 1\right) \quad -(48)$$

Therefore:

$$\frac{1}{\epsilon} = \sin\left(\frac{\Delta\phi}{2}\right) \quad -(49)$$

and:

$$\frac{1}{\epsilon_1} = \sin \Delta\phi . \quad -(50)$$

For small deflections:

$$\frac{1}{\epsilon} \sim \frac{\Delta\phi}{2} \quad -(51)$$

so:

$$\frac{1}{\epsilon_1} \sim \Delta\phi . \quad -(52)$$

Doubling the eccentricity in this way can be described self consistently by a change of x to x_1, so:

$$\frac{\alpha_1}{1+\epsilon_1 \cos(x\theta)} = \frac{\alpha}{1+\epsilon \cos(x_1\theta)} \quad -(53)$$

where:

$$\alpha_1 = a\left(\epsilon_1^2 - 1\right), \quad -(54)$$
$$\alpha = a\left(\epsilon^2 - 1\right). \quad -(55)$$

It follows that:

$$\frac{\left(\epsilon_1^2 - 1\right)}{1+\epsilon_1 \cos(x\theta)} = \frac{\left(\epsilon^2 - 1\right)}{1+\epsilon \cos(x_1\theta)} \quad -(54)$$

where:

$$\epsilon = 2\epsilon_1 \quad -(55)$$

and

$$\cos(x_1\theta) = \frac{1}{\epsilon}\left(\left(\frac{\epsilon^2-1}{4\epsilon^2-1}\right)\left(1 \pm 2\epsilon\cos(x\theta)-1\right)\right), \quad -(56)$$

$$-1 \leq \cos(x_1\theta) \leq 1, \quad -1 \leq \cos(x\theta) \leq 1. \quad -(57)$$

The requirements (56) and (57) restrict the possible values of x and x_1 and the results of this procedure are discussed in Section 3.

3. COMPUTATIONAL METHODS AND GRAPHICAL RESULTS

Section by Dr. Horst Eckardt

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