THE x THEORY OF PHOTON MASS AND RELATIVISTIC

PHENOMENA: REFUTATION OF THE EINSTEIN THEORY.

by

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ABSTRACT

The x theory of relativity is based directly on the experimentally observed data for planetary precession and is an example of Cartan geometry and ECE theory. It is shown to produce a precisely self consistent description of all relevant relativistic phenomena and of photon velocity and photon mass. The Einstein theory does not produce planetary precession, and results in a disastrous singularity, so should be abandoned as obsolete. An extensive study of new phenomena in optics is presented in evidence of photon mass. These data have been collected over a span of some years by G. J. Evans and T. Morris.

Keywords: ECE theory, x theory, self consistent description of relativistic phenomena, photon mass, new optical data.

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1. INTRODUCTION

In recent papers of this series {1 - 10} the R and x sub theories of ECE theory have been introduced and shown to give a precise description of planetary precession without any reference to the Einstein field equation. It is well known that the latter is obsolete and incorrect due to neglect of torsion. The claims attributed to the Einstein field equation must be abandoned, and a new theory put in its place. This is accomplished straightforwardly in Section 2 of this paper by x theory, which is based directly on the experimental data for planetary precession using Ockham's Razor and the simplest description of the precessing ellipse. It is assumed that the experimental data are precise and correct. The data produce an experimental precession per radian which is incorporated directly in the equation of the precessing ellipse. This equation is then used to produce a precisely correct and self consistent description of orbital precession, light deflection due to gravitation, gravitational time delay, photon velocity and photon mass given some reasonable additional assumptions. It is shown that the precisely correct description of the precessional data given by x theory results in a force law that is not the Einstein force law. The latter therefore cannot be a precise description of precession as so often claimed in the literature. The Einstein force law cannot be the correct force law, an attempt to equate the two laws results in the Einstein theory becoming singular, a complete disaster for the theory and standard physics. It is easy to show that the Einstein theory is incorrect, so its continued use is unscientific.

In Section 3 a graphical analysis is given of the way in which the Einstein theory becomes singular. The x theory on the other hand is a well defined precessing ellipse and is well behaved mathematically. In Section 4 an extensive experimental study is presented of new data in optics which have no explanation in standard physics. This study has been carried out by G. J. Evans and T. Morris, who have devised a theory of the new effects.

2. THE DESCRIPTION OF RELATIVISTIC PHENOMENA WITH x THEORY.

By Ockham's Razor of philosophy the simplest description of a precessing conical section is used {1 - 10}:

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

where r and θ define the plane polar coordinates, α is the semi latus rectum or half right latitude, and ϵ is the eccentricity. The precession per radian x is observed experimentally to be:

$$x = 1 + \frac{3MG}{c^2 \alpha} \quad -(2)$$

where M is the mass of the attracting object at the focus of the conic section, G is Newton's constant and c is the vacuum speed of light. It is claimed in astronomy that x is always observed with great precision. This claim has been criticised in UFT240 on www.aias.us but is accepted in this paper for the sake of argument.

Note carefully that x theory is based directly on the experimental data for all orbital precessions and is a precise description of all orbital precessions. In this section it is used as a description of other well known phenomena: light deflection due to gravitation and gravitational time delay, and used to obtain an equation for photon velocity. With some additional assumptions this gives the photon mass.

Light deflection due to gravitation {1 - 10} can be defined in two ways:

$$\Delta\theta = 2\int_{R_0}^{\infty} \frac{d\theta}{dr}\, dr - \pi \quad -(3)$$

and:

$$\Delta\theta \sim 2\sin\left(\frac{\Delta\theta}{2}\right) = \frac{1}{\epsilon}. \quad -(4)$$

From Eq. (1):

$$\Delta\theta = \frac{2\alpha}{x\epsilon}\int_{R_0}^{\infty}\frac{1}{r^2}\left(1-\frac{1}{\epsilon^2}\left(\frac{\alpha}{r}-1\right)^2\right)^{-1/2}dr - \pi \quad -(5)$$

This equation was evaluated numerically and also has an analytical solution as described in UFT263. The analytical solution was produced correctly by the numerical method, proving that the numerical methods used in this series of papers are precise and accurate. This procedure produced the precisely correct light deflection by the sun:

$$\Delta\theta = 8.484 \times 10^{-6} \text{ rad} \quad -(6)$$

and defined the hyperbolic path of the light by:

$$\alpha = 1.639992 \times 10^{14} \text{ m}, \quad -(7)$$

$$\epsilon = 235{,}735.06. \quad -(8)$$

This eccentricity again gives the precisely correct light deflection using:

$$\Delta\theta = 1/\epsilon. \quad -(9)$$

This shows that the two methods used in previous work to calculate light deflection are precisely correct and give the same results.

The x theory is therefore a precisely correct and self consistent method of describing both precession and light deflection due to gravitation. The Einstein equation is incorrect and should no longer be used.

The time delay due to gravitation is a simple extension of the theory of light deflection using

$$\frac{dt}{dr} = \frac{dt}{d\theta}\frac{d\theta}{dr} = \frac{mr^2}{L}\frac{d\theta}{dr} = \frac{m\alpha}{x\epsilon L}\left(1-\epsilon^2\left(\frac{\alpha}{r}-1\right)^2\right)^{-1/2} \quad -(10)$$

where L is the total angular momentum, a constant of motion, and m is the mass of the orbiting particle. The Cartan spin connection of x theory is the angular velocity, defined by

$$\omega = \frac{L}{mr^2}. \quad -(11)$$

Various experiments of time delay can be reproduced accurately by calculating the time take to go from one point to another. Note carefully that the total orbital linear velocity is given by:

$$v^2 = \left(\frac{dr}{dt}\right)^2 + r^2\left(\frac{d\theta}{dt}\right)^2 \quad -(12)$$

whose radial component is:

$$v_r = \frac{dr}{dt}. \quad -(13)$$

So the expression (10) for time delay due to gravitation is valid only when the radial component dominates, in the large r limit.

The total linear velocity from x theory is given by using Eq (1) in Eq. (12). This gives:

$$v^2 = \omega^2\left(r^2 + \left(\frac{x\epsilon r^2}{\alpha}\sin(x\theta)\right)^2\right) \quad -(14).$$

Using Eq. (1) gives:

$$v^2 = \frac{L^2}{m^2}\left(\frac{2x^2}{dr} + x^2\left(\frac{\epsilon^2 - 1}{\alpha^2}\right) + \frac{1}{r^2}\left(1 - x^2\right)\right). \quad -(15)$$

The assumption:

$$x = 1 \quad -(16)$$

gives the Newtonian velocity:

$$v^2 = x^2 MG\left(\frac{2}{r} - \frac{1}{a}\right) + \frac{L^2}{mr^2}\left(1 - x^2\right), \quad x = 1 \quad -(17)$$

and the Newtonian orbit, a static conical section:

$$r = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(18)$$

Here a is the semi major axis defined for example for the ellipse by:

$$\alpha = a\left(1 - \epsilon^2\right). \quad -(19)$$

The ratio L / m can be found experimentally using:

$$\alpha = \frac{L^2}{m^2 MG}. \quad -(20)$$

At closest approach:

$$R_0 = \frac{\alpha}{1 + \epsilon} \quad -(21)$$

and can be defined as the radius of the sun:

$$R_0 = 6.955 \times 10^8 \text{ m} \quad -(22)$$

as given conventionally. So the photon velocity can be found at closest approach in light deflection due to gravitation and a numerical analysis is given in Section 3.

The radial part of the photon velocity is given by:

$$V_r = \frac{dr}{dt} = \frac{x\epsilon L}{m\alpha}\left(1 - \frac{1}{\epsilon^2}\left(\frac{\alpha}{r} - 1\right)^2\right)^{1/2} \quad -(23)$$

so at closest approach:

$$V_r = \frac{x\epsilon L}{m\alpha}\left(1 - \frac{1}{\epsilon^2}\left(1 + \epsilon - 1\right)^2\right)^{1/2} = 0. \quad -(24)$$

The radial velocity of the photon vanishes at closest approach because this is a turning point {11} of the orbit. For the hyperbola it is the perihelion. The total velocity of the photon at closest approach is therefore:

$$V_\theta = \omega R_0 = \frac{L}{mR_0} \quad -(25)$$

and can be evaluated exactly using:

$$\frac{L}{m} = \left(\alpha M G\right)^{1/2} \quad -(26)$$

For a sun radius of 6.955×10^8 m, the photon velocity is $2.122 \times 10^8 \, ms^{-1}$, which is considerably below c (2.998×10^8 m /s). This is a very important result because it shows the existence of photon mass. In the obsolete Einstein theory the photon has identically zero mass and always travels at c in the vacuum.

In the near Newtonian approximation the photon mass can be calculated using the equation {11}

$$\frac{\alpha}{\epsilon^2 - 1} = \frac{mMG}{2E} \quad -(27)$$

where E is the kinetic energy of the photon. Therefore the photon mass is:

$$m = \frac{2}{MG}\left(\frac{\alpha}{\epsilon^2 - 1}\right)E = 4.446 \times 10^{-17} E \quad -(28)$$

using the data given already in this section. As is well known from the de Broglie / Einstein equations:

$$E = \gamma mc^2 = \hbar\omega \quad -(29)$$

$$\underline{p} = \gamma m\underline{v} = \hbar\underline{\kappa} \quad -(30)$$

where E is the relativistic energy:

$$E = \gamma mc^2 \quad -(31)$$

and $\underline{p}$ the relativistic momentum:

$$\underline{p} = \gamma m\underline{v}. \quad -(32)$$

Here $\hbar$ is the reduced Planck constant, and ω and $\underline{\kappa}$ are the angular frequency and wavenumber of the photon with mass. Using Eq. (29) with a photon velocity at closest approach of 2.122×10^{8} m s^{-1} gives a photon mass of :

$$m = 5.205 \times 10^{-51}\omega. \quad -(33)$$

Assuming that the angular frequency of visible light is:

$$\omega = 2 \times 10^{-15} \text{ rad s}^{-1} \quad -(34)$$

gives a photon mass of:

$$m = 1.04 \times 10^{-35} \text{ kg}. \quad -(35)$$

Close to previous estimates in several ECE papers.

Finally in this section it is proven straightforwardly that the Einstein force law from the obsolete Schwarzschild metric (SM) does not give a precessing ellipse. This result should in logic lead to the abandonment of the Einstein theory. Consider the famous force law

$$m\frac{d^2 r}{dt^2} = -\frac{mMG}{r^2} + \frac{L^2}{mr^3} \quad -(36)$$

which is the sum of inverse square attraction and centrifugal repulsion. This appears in every textbook and appears to have been given first by Leibniz in 1689. This law corresponds to the Kepler / Hooke / Newton ellipse:

$$r = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(37)$$

Using the equation {1 - 11}:

$$\begin{aligned} \underline{F} &= m\left(\ddot{r} - r\dot{\theta}^2\right)\underline{e}_r \\ &= -\frac{L^2}{mr^2}\left(\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \frac{1}{r}\right)\underline{e}_r \end{aligned} \quad -(38)$$

the orbit (37) leads to the inverse square law for attraction:

$$\underline{F} = -\frac{mMG}{r^2} = m\frac{d^2 r}{dt^2} - \frac{L^2}{mr^3} \quad -(39)$$

However the ellipse is observed experimentally to precess according to x theory:

$$r = \frac{\alpha}{1+\epsilon\cos(x\theta)} \quad -(40)$$

and using Eq. (38), Eq. (40) leads to:

$$m\frac{d^2 r}{dt^2} = (x^2-1)\frac{L^2}{mr^3} - \frac{x^2 L^2}{\alpha m r^2} + \frac{L^2}{mr^3} = x^2\left(-\frac{mMG}{r^2} + \frac{L^2}{mr^3}\right) \quad -(41)$$

The precession causes the famous result by Leibniz to be multiplied by x^2, a simple and powerful new result. Equivalently, the Leibniz result is modified by:

$$t_1 = xt \quad -(42)$$

so the effect of orbital precession is:

$$t \rightarrow \frac{t}{x} = t\left(1+\frac{3MG}{c^2\alpha}\right)^{-1} \sim t\left(1-\frac{3MG}{c^2\alpha}\right) \quad -(43)$$

for all observable precessions in the universe.

Eq. (41) is the correct force law for the orbit (40).

The force law from the old SM is well known {1 - 11} to be:

$$m\frac{d^2 r}{dt^2} = -\frac{mMG}{r^2} + \frac{L^2}{mr^3} - \frac{3GML^2}{mc^2r^4} \quad -(44)$$

One can try to force Eq. (44) to give the correct law (41) by equating Eqs. (44) and (41). After some simple algebra this procedure leads to:

$$x = \left(1 + \frac{3MG}{c^2}\left(1-\frac{r}{\alpha}\right)^{-1}\right)^{1/2} \quad -(45)$$

This cannot be correct because x is incorrectly r dependent and the Einstein force law (44) can never give the precessing orbit (40), Q. E. D. The x theory on the other hand is based directly on the experimentally observed precessing orbit. The latter can be expressed as:

$$\theta = \frac{1}{x} \cos^{-1}\left(\frac{1}{\epsilon}\left(\frac{\alpha}{r} - 1\right)\right) \quad -(46)$$

with:

$$x = 1 + \frac{3MG}{c^2 \alpha} \quad -(47)$$

and is plotted in Section (3). It is a well behaved function. The Einstein theory on the other hand gives a singularity or infinity. The two theories are compared directly and graphically in Section 3. This is a disaster for standard physics and overturns a century of useless dogma in favour of straightforward Baconian physics.

3. NUMERICAL STUDY OF PHOTON VELOCITY AND GRAPHICAL DEMOSNTRATION OF THE FAILURE OF THE EINSTEIN THEORY.

Section by Horst Eckardt

4) NEW OPTICAL RESULTS AND THE THEORY OF PHOTON MASS

Section by G. J. Evans and T. Morris

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The x theory of photon mass and relativistic phenomena: refutation of the Einstein theory

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3 Numerical study of photon velocity and graphical demonstration of the failure of the Einstein theory

The components of the photon velocity are given by Eqs.(23, 25):

$$v_r = \frac{x\,\epsilon\,L}{m\,\alpha}\sqrt{1-\frac{1}{\epsilon^2}\left(\frac{\alpha}{r}-1\right)^2}, \tag{48}$$

$$v_\theta = \frac{L}{m\,r}. \tag{49}$$

These components together with the modulus of velocity

$$v = \sqrt{v_r^2 + v_\theta^2} \tag{50}$$

have been plotted in Fig. 1 for parameters $x = m = \alpha = L = 1$, $\epsilon = 10$, i.e. for a hyperbolic orbit. At the radius of closest approach we find $v_r = 0$ and v_θ at maximum as expected. The total velocity is at maximum for closest approach due to Newtonian attraction. This is not compatible with photons moving nearly with speed of light. Therefore we use alternatively the Minkowski metric with the relation

$$\frac{dt}{d\tau} = \gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \tag{51}$$

for proper time τ and coordinate time t. The photon velocity in its rest system is

$$v^2 = \left(\frac{dr}{d\tau}\right)^2 + r^2\left(\frac{d\theta}{d\tau}\right)^2, \tag{52}$$

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however it is observed from outside so that we have to use time parameter t, leading to the replacements

$$v_r \to v_r/\gamma, \quad v_\theta \to v_\theta/\gamma. \tag{53}$$

The corresponding plot is shown in Fig. 2. One has to choose the velocity of light in a suitable way so that v<c, in this case we used $c = 12$ (all parameters in arbitrary units). Now the total velocity is at minimum at closest approach as described in section 2. This is a non-classical effect of photon mass. In Figs. 1 and 2 the radius of closest approach has been marked by a vertical line.

Now we give a graphical example for the difference between x theory and Einsteinian theory, comparing the force laws (40) and (44) for an ellipse. By equating both laws, we obtain two expressions for the x factor, one from x theory itself (Eq.(47)) and one from Einsteinian theory (Eq.(45)) which is radius dependent. Writing both x factors in terms of constants of motion, we have

$$x_{\text{x theory}} = 1 + \frac{3\ L^2}{m^2\ c^2\ \alpha^2}, \tag{54}$$

$$x_{\text{Einstein}} = \sqrt{1 + \frac{3\ L^2}{m^2\ c^2\ r(r-\alpha)}}. \tag{55}$$

The Einstein x factor is seemingly similar to that of x theory, except a square root and that α^2 is replaced by $r(r-\alpha)$. This effects a pole for $r = \alpha$, leading to a fundamental dissimilarity. This can be seen from the plot of $\theta(r)$, see Fig. 3. Both curves come close at the boundaries of r but differ significantly by appearance of the pole. The Einsteinian x factor gives completely senseless results.

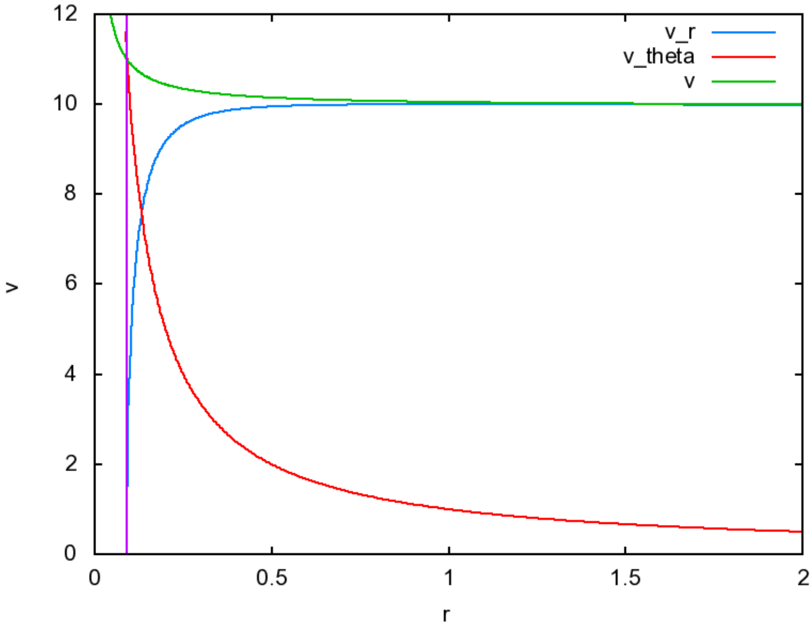

Figure 1: Velocity components for $x = m = \alpha = L = 1,\ \epsilon = 10$.

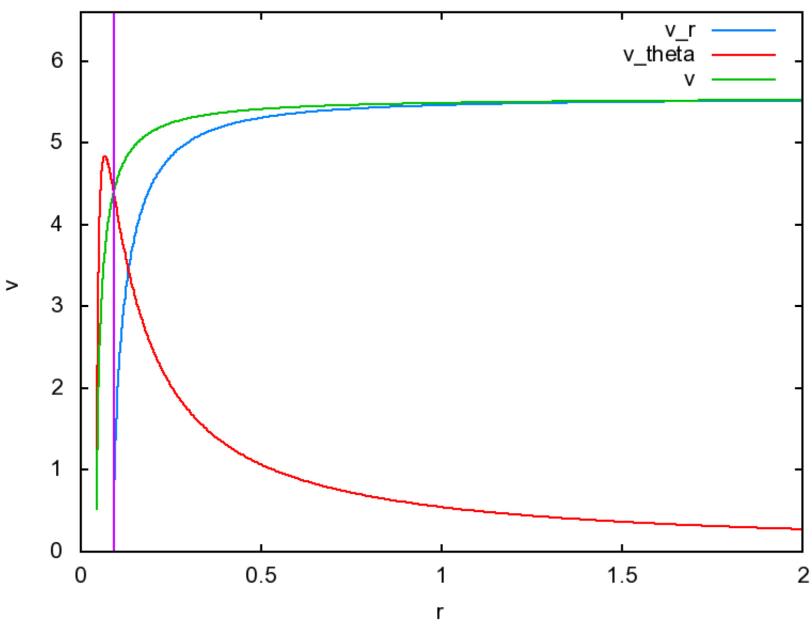

Figure 2: Velocity components as in Fig. 1 but with relativistic γ factor ($c = 12$).

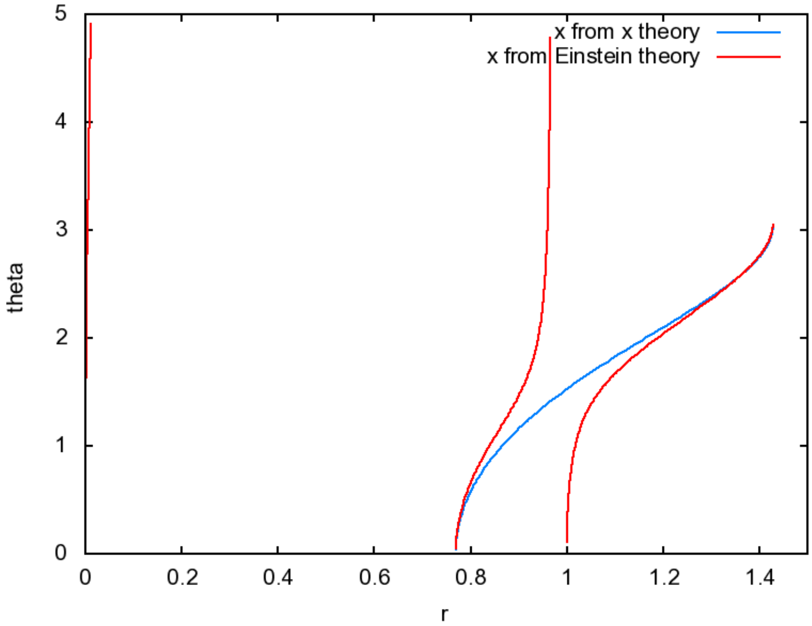

Figure 3: Orbital function $\theta(r)$ for x theory and Einstein theory.

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