239(9): Consequences of the Einstein Force Law

The force law can be written as:

$$\underline{F} = -\frac{MG}{r^2}\left(m + \frac{3L_0^2}{mc^2r^2}\right)\underline{e}_r \quad -(1)$$

where

$$L_0^2 = dm^2MG \quad -(2)$$

so

$$\underline{F} = -\frac{mMG}{r^2}\left(1+\frac{3}{2}\frac{dr_0}{r^2}\right)\underline{e}_r \quad -(3)$$

where

$$r_0 = \frac{2MG}{c^2} \quad -(4)$$

is the old Schwarzschild radius. For the earth sun system m is the mass of the Earth and M the mass of the sun, and d is the half right latitude of the orbit. We have:

$$r_0 = 2950 \text{ metres}$$
$$d = 1.496 \times 10^{11} \text{ metres}$$
$$r_{av} = 1.496 \times 10^{11} \text{ metres}$$

so:

$$\boxed{\underline{F} = -\frac{mMG}{r^2}\left(1 + 2.96 \times 10^{-8}\right)\underline{e}_r} \quad -(5)$$

This is a large correction, it means that the effective mass of the sun, about 2×10^{30} kilograms, is increased by order 10^{24} kilograms. In general relativity eq. (5) must be a universal force law, which should replace the Newtonian law under all circumstances.

2) For Mercury, the observed perihelion precession is 5750 arcsec / century. Classical Newtonian N planet perturbation theory gives a value of 5707 arcsec / century using:

$$\underline{F} = -\frac{mMG}{r^2}\,\underline{e}_r \qquad -(6)$$

The other 43" per century is "explained" using eq. (5). This procedure is glaringly self inconsistent, and came about for historical reasons only.

<u>The</u> <u>self</u> <u>consistent</u> <u>procedure</u> is <u>to use</u> eq. (3) in <u>the N planet perturbation theory</u>. For the earth / sun / other planet / moon / etc. system eq. (3) must be used in the N body gravitational problem. For the Mercury / other bodies system <u>the</u> <u>whole</u> of the observed 5750 arcseconds per century must be reproduced theoretically from eq. (1) or eq. (3).

It is very probable that eq. (1) will <u>not</u> reproduce the experimental data for any planet. Eq. (1) fails completely in whirlpool galaxies.