406(5): Vacuum Fluctuations and Light Deflection due to Gravitation.

In preceding notes it has been shown that all observable precessions can be expressed as:

$$\Delta \phi = \frac{2}{3} \frac{\langle \delta \underline{r} \cdot \delta \underline{r} \rangle}{r^2} \quad -(1)$$

and that this is the only correct way of describing precessions. The Einstein theory has been refuted in many ways. The fundamental origin of eq. (1) is the ECE2 force equation:

$$\underline{F} = - \underline{\nabla} \phi_0 + \underline{\omega} \phi_0 \quad -(2)$$

where $\underline{\omega}$ is the spin connection vector and where ϕ_0 is the gravitational potential:

$$\phi_0 = - \frac{mMG}{r} \quad -(3)$$

Eq. (2) is ECE2 covariant and corresponds to the relativistic velocity:

$$\underline{v} = \gamma \underline{v}_N \quad -(4)$$

where $\underline{v}_N$ is the Newtonian velocity and:

$$\gamma = \left(1 - \frac{v_N^2}{c^2} \right)^{-1/2} \quad -(5)$$

is the Lorentz factor. So:

$$\boxed{\underline{F} = m \frac{d(\gamma \underline{v}_N)}{dt} = - \underline{\nabla} \phi_0 + \underline{\omega} \phi_0} \quad -(6)$$

Considering the radial component of eq. (6):

$$F = m \frac{d(\gamma v_N)}{dt} = - \frac{\partial \phi_0}{\partial r} + \omega_r \phi_0 \quad -(7)$$

and

$$\omega_r \phi_0 = m \frac{d}{dt} (\gamma v_N) + \frac{\partial \phi_0}{\partial r} \quad -(8)$$

In the non relativistic limit:

2)

$$\gamma \rightarrow 1, \quad \omega_r \rightarrow 0 \quad -(9)$$

and

$$m \frac{dv_N}{dt} + \frac{\partial \phi}{\partial r} = 0 \quad -(10)$$

Eq. (10) is the well known Newtonian principle of equivalence:

$$\underline{F} = m\underline{g} = -mMG \frac{\underline{r}}{r^3} \quad -(11)$$

Therefore the vacuum force:

$$F(\text{vac}) = \phi_0 \omega_r \quad -(12)$$

means that the Newtonian principle of equivalence is no longer true. It is replaced by eq. (6).

From eq. (4):

$$v^2 = \frac{v_N^2}{\left(1 - \frac{v_N^2}{c^2}\right)} \quad -(13)$$

so

$$v_N^2 = \frac{v^2}{1 + \frac{v^2}{c^2}} \quad -(14)$$

$$\xrightarrow[v \rightarrow c]{} \frac{c^2}{2}$$

So in an ECE2 covariant theory v_N^2 has an upper bound of $c^2/2$. This is a direct result of the definition of relativistic velocity, eq. (4). This upper bound is a consequence of the spin connection $\underline{\omega}$ in eq. (6). Without the spin connection, the Newtonian velocity v_N can increase indefinitely.

The Newtonian theory of light deflection at the perihelion is given in UFT324 and is based on

3) the conic section:

$$r = \frac{\alpha}{1+\epsilon\cos\phi} \quad -(15)$$

and the Newtonian velocity:

$$v_N^2 = mG\left(\frac{2}{r} - \frac{1}{a}\right) \quad -(16)$$

Here a is the semi major axis:

$$a = \frac{\alpha}{1-\epsilon^2} \quad -(17)$$

and R_0 is the distance of closest approach:

$$R_0 = \frac{\alpha}{1+\epsilon} \quad -(18)$$

It follows that:

$$v_N^2 = \frac{mG}{R_0}(1+\epsilon) \quad -(19)$$

In light grazing the sun:

$$\epsilon \gg 1 \quad -(20)$$

so

$$\epsilon \sim \frac{R_0 v_N^2}{mG} \quad -(21)$$

The angle of deflection is

$$\Delta\phi \sim \frac{2}{\epsilon} = \frac{2mG}{R_0 v_N^2} \quad -(22)$$

For a photon the relativistic velocity v approaches c, so from eq. (14):

$$v_N^2 \rightarrow \frac{c^2}{2} \quad -(23)$$

and

$$\boxed{\Delta\phi = \frac{4mG}{c^2 R_0}} \quad -(24)$$

This is exactly the experimental result, which is fundamentally the consequence of eq. (2), and not of the Einstein theory.

t) The Einstein theory of light deflection due to gravitation has been refuted in many ways in the UFT series, notably UFT150 – UFT155, which have become classics.

The next note will calculate the spin connection ω_r from eq. (8) and express it in terms of $\langle \delta r \cdot \delta r \rangle$. So light deflection due to gravitation is due to $\langle \underline{\delta r} \cdot \underline{\delta r} \rangle$.