ON THE ORIGIN OF DARK MATTER AS SPACETIME TORSION

In the manifold with torsion and curvature both present, the field theory is described in barebones notation by:

$$T = d \wedge q + \omega \wedge q \quad -(1)$$

$$D \wedge T = R \wedge q \quad -(2)$$

$$R = d \wedge \omega + \omega \wedge \omega \quad -(3)$$

$$D \wedge R = 0 . \quad -(4)$$

In the 1915 Einstein / Hilbert theory:

$$\boxed{T = 0} \quad -(5)$$

so:

$$\left.\begin{aligned} d \wedge q + \omega \wedge q &= 0 \quad -(6) \\ R \wedge q &= 0 . \quad -(7) \end{aligned}\right] \text{Einstein Hilbert}$$

In the presence of torsion therefore, the Newton inverse square law is affected. This means that torsion generates effective mass, and this effective mass is dark matter. Torsion may also be responsible for other observed departures from the 1915 theory given by eqns (5)-(7)

2) Newtonian Limit

The Newtonian limit is obtained from the Evans wave equation appropriate to eqns. (5) to (7). This is:

$$(\square + kT)\, q^a_\mu = 0 \quad -(8)$$

The Newton law:

$$\underline{F} = m\underline{g} \quad -(9)$$

is the non-relativistic classical limit of the Dirac equation. The latter is a limit of eqn. (8) given by:

$$T \rightarrow \frac{m}{V} \; ; \; kT \rightarrow \left(\frac{mc}{\hbar}\right)^2 . \quad -(10)$$

The tetrad for the Dirac eqn. is:

$$q^a_\mu = \begin{bmatrix} q^R_1 & q^R_2 \\ q^L_1 & q^L_2 \end{bmatrix} \quad -(11)$$

and the spinor is

$$\phi = \begin{bmatrix} q^R_1 \\ q^R_2 \\ q^L_1 \\ q^L_2 \end{bmatrix} = \begin{bmatrix} \phi^R \\ \phi^L \end{bmatrix} . \quad -(12)$$

3) Thus:

$$\left(\Box + \left(\frac{mc}{\hbar} \right)^2 \right) \psi = 0 \quad -(13)$$

is the Dirac equation. The Schrödinger equation is the non-relativistic limit of eqn (14):

$$\frac{\hbar^2}{2m} \nabla^2 \psi = -i\hbar \frac{\partial \psi}{\partial t} . \quad -(14)$$

using the operator relations:

$$En = i\hbar \frac{\partial}{\partial t} , \quad \underline{p} = -i\hbar \underline{\nabla} \quad -(15)$$

eqn. (14) is:

$$En = \frac{p^2}{2m} \quad -(16)$$

which is the Newtonian limit.

The Poisson equation is found from the Evans wave equation in the limit when the base manifold approaches a Minkowski spacetime. In this limit:

$$\nabla^a \rightarrow \nabla^\mu \quad -(17)$$

and

$$q^a_\mu \longrightarrow 1 . \quad -(18)$$

In the limit where q^a_μ is time -

4)

independent, and when:

$$T \rightarrow \frac{m}{V} = \rho \quad -(19)$$

the wave equation (8) becomes the Poisson equation of Newtonian dynamics:

$$\nabla^2 q_V = k\rho \quad -(20)$$

where:

$$q_V = q^1{}_1 = q^2{}_2 = q^3{}_3 \sim 1 \quad -(21)$$

using:

$$k = \frac{8\pi G}{c^2} \quad -(22)$$

and:

$$\Phi = \frac{1}{2} c^2 q_V \quad -(23)$$

we obtain the Poisson eqn. in standard form:

$$\nabla^2 \Phi = 4\pi G \rho. \quad -(24)$$

Eqn. (24) gives the inverse square law of Newton. Eqn (18) gives eqn (9).

In the presence of torsion the Newtonian laws are affected. Torsion gives rise to an effective mass which is dark matter.

5) Therefore the Dirac, Schrödinger, Newton and Poisson eqns are all limits of the Evans wave equation, when torsion is zero.

When torsion is not zero, all these equations are affected, because the tetrad is defined by eqns (1) - (4), and not (5) - (7).

The torsion is governed by the same equations as electrodynamics, except for the factor $A^{(0)}$:

$$d \wedge T^a = -\left(q^b \wedge R^a{}_b + \omega^a{}_b \wedge T^b\right)$$
$$d \wedge \tilde{T}^a = -\left(q^b \wedge \tilde{R}^a{}_b + \omega^a{}_b \wedge \tilde{T}^b\right). \quad \longrightarrow (25)$$

Therefore dark matter behaves like electrodynamics but without the presence of charge. This is why dark matter cannot be detected by telescopes. It can only be detected by indirect means. If there is a large amount of torsion in a region near a star, the star's orbital characteristics are changed.