SOME THEORETICAL PHYSICS

- CAN WE FINALLY QUANTIZE NEWTON'S GRAVITY FORCE EQUATION?  
  (We've only been trying for over 100 years)

- DOES NEWTON'S UNIVERSAL CONSTANT G ACCOUNT FOR MISSING DARK MATTER?

- IF SO, DOES THE MISSING DARK MATTER IN TURN ACCOUNT FOR THE RADIUS OF THE UNIVERSE?
Energy density \( \omega = \varepsilon_0/2 E^2 + \mu_0/2 H^2 \) (J m\(^{-3}\))

Momentum density \( g = S/c^2 = DxB \) (N s m\(^{-3}\))

where

\( E = \) electric field intensity  \( \rightarrow D = \) electric flux density

\( H = \) magnetic field intensity  \( \rightarrow B = \) magnetic flux density

\( \varepsilon_0 = \) space’s permittivity  \( \mu_0 = \) space’s permeability,

and \( S \) is the Poynting vector.

\( \frac{1}{8\pi} \varepsilon_0 E \cdot W^2 \)

\( c = \left( \frac{1}{\varepsilon_0 \mu_0} \right)^{1/2} \)

\( 4\pi(10^7) H \cdot W^{-1} \)

“The gravitational field transfers energy and momentum to the matter, in that it exerts forces upon it and gives it energy. If we let \( U_0 \) be the energy of the light field arriving at a unit area per second, then the momentum arriving at a unit area per second is \( U_0/c \). But the momentum is traveling at the speed \( c \), so its density in front of the absorber must be \( U_0/c^2 \).”

Momentum density \( \sigma_m = \xi/c^2 \)

Example: Earth’s embedded gravitational mass resulting from absorption of momentum density in early creation eras is \( 5.98 \times 10^{24} \) kg, equivalent to earth’s inertial mass.
$F_{\text{gravity}} = \frac{Gm_1 m_2}{d^2}$,
$m$ kg, $d$ meters, and
$G = 6.672 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$
(No correlation to electromagnetic field)

Comparing with the charge equation:

$F_{\text{charge}} = \frac{q_1 q_2}{(4\pi \varepsilon_0 d^2)}$,
$q$ coulomb charge, $d$ meters,
$\varepsilon_0 = 8.854 \times 10^{-12} \text{ F/m}$
(Field permittivity of space)

Substituting $\xi/c^2$ for each gravitational mass:

$F_{\text{gravity}} = \frac{G\xi_1 \xi_2}{(c^4 d^2)}$. 
\[ \frac{1.726 \pm 0.1}{5} \rightarrow 5 \times 10^8 \text{photons m}^{-3} \]

\[ G = \frac{10^8}{4\pi nc} \text{ (n photons m}^{-3}\text{),} \]
where \( nc = 1.197 \times 10^{17} \text{ photons m}^{-2} \text{ s}^{-1} \),
photon flux density of the background.

Substituting in the gravity force equation:

\[ F_{\text{gravity}} = \frac{10^8 \xi_1 \xi_2}{(4\pi nc^5 d^2)}, \]

\( G \) becomes a function of the background's momentum density, and with gravitational mass \( \xi/c^2 \) also a function of this density, gravity becomes unified with the electromagnetic field.
For a spherically symmetric universe of \( \approx 10^{22} \) solar masses, total dark matter is

\[
4\pi r_o^3 \sigma / 3 \approx 9 \times 10^{21} \text{ solar masses} \\
\approx 18 \times 10^{51} \text{ kg},
\]

where one solar mass = \( 2 \times 10^{30} \) kg.

Density \( \sigma \), using COBE temperature of 2.726 ± .01 K, is a weak \( \approx 4.64 \times 10^{-31} \) kg m\(^{-3} \) (the momentum density \( \xi / c^2 \) of the background radiation).

The upper limit radius of the radiation is then approximately

\[
r_o = 2 \times 10^{27} \text{ meters}.
\]
CONCLUSIONS

1. The Poynting vector product \( S = c^2DxB \) was absorbed by matter in early eras. Since it has *units* of momentum density, a 4-vector with a time component, it is ideal for describing acceleration and direction of gravity. Therefore we can confidently predict it is the *field source* of gravitational potentials in all massive bodies.

2. The *quantized* universal constant \( G \) is within 0.007% of the published value in the 1996 Handbook of Chemistry and Physics to 6 significant figures. Cannot we safely conclude then that the momentum density of free space is indeed Newton's \( G \) which was unknown at the time of his work?

3. Using \( G \) for the universe's field source of non-baryonic dark matter, totally accounts for "missing" \( 9 \times 10^{21} \) solar masses (without requiring black holes).

4. This also predicts the radius of the cosmic microwave background radiation to be \( 2 \times 10^{27} \) meters. This is not altered significantly when taking into consideration a relic neutrino background (if it has momentum density).

5. Cosmologically, this predicted radius may correlate with a dark matter background radiation (non-luminous) traveling at c-speed while the matter universe (optically visible) is traveling at a Hubble flow rate.

*Unified field theory - TO BE CONTINUED AT DPF98*

Paper 5320  6/6
F. W. Keeney