ADDENDUM TO PAPER ENTITLED
"A NEW PERSPECTIVE ON ADVANCED SPACE TRAVEL"

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Abstract

This paper is prepared in order to point out to the reader, if the reader is not already so informed, of some glaring omissions and/or deficiencies in the original paper so titled. (1) the first omission lies in the fact that no clear cut indication was given of the source of the so called "mass velocity vector". Originally, the idea was obtained from Bernoulli fluid flow theory, but, lately, the author has discovered that this idea can also be derived from a four dimensional covariant (or tensor) formulation of the Fokker-Planck equation, which describes the time development of a type of random/stochastic process called a Markoff process. (2) The second omission was a failure to give the equation for the Fermi constant in terms of the fundamental constants that were appropriate thereto. (3) The third omission involved giving only the value of the predicted mass that CERN should find as 1118 times the mass of the proton, without giving the Gev value as well. (4) The fourth omission consisted of a math error on page 20 of the original manuscript: the author failed to pick up the mathematical error. (5) The fifth omission is found on page 23 of the original manuscript, in which the author discusses the reason why photons do not travel at infinite speed. The example used there was not very enlightening, and the author realized it at the time. In order to make up for that omission, the author has devised a new example which, it is hoped, will make the inertial problem of the photon much clearer. (6) This is a grab bag of future research problems: which ones are real, imaginary, crazy, or insane?

Omission 1:

The mass-velocity vector will be defined as follows:

$$d \xi_{(1)}{}^\mu = [\, a\, u^\mu + I\, b\, \varphi^{/\mu}\,)]\, ds. \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1)$$

where $a = (|\eta|\, m_o c^2)^{\frac{1}{2}}$ and $b = (m_o c^2)^{\frac{1}{2}}$ and $|\eta| = |G/G_o|$ where $|G|$ is the absolute magnitude of a variable scalar gravitational 'constant' and is assumed to be generally complex, and, hence; dependent upon space and time coordinates (and therefore capable of being Fourier analyzed or at least to a degree, stochastic, such as the time dependence of raindrops on a roof). G_o is the usual gravitational 'constant'; m_o is the mass of the spacecraft in its rest frame, and u^μ is the four velocity $d\, x^\mu/ds$.

The derivation result used will be that of C. Kittel (and his source), referenced at the end of this paper. The derivation derives from the Smoluchowski equation using a conditional probability $P(z|y, t)$ that a particle at z at t = 0 will be at y during the time interval Δt. The result derived is the Fokker-Planck equation without sources:

$$\partial P / \partial t + \partial [A(y) P] / \partial y - \tfrac{1}{2} \partial^2 [B(y) P] \partial y^2 = 0$$

If $A(y) = 0$, then there are equal probabilities of moving either left or right. If B(y) is independent of position or in other words there is an isotropic environment, then this reduces to the usual diffusion equation. Now let's construct the covariant formulation utilizing the symbolism that $_{/\mu}$ is a covariant partial derivative with respect to coordinate μ and $^{/\mu}$ represents the contravariant partial derivative with respect to coordinate μ.

$$(A^\mu P)_{/\mu} = \nabla \bullet (\mathbf{A}\, P) + \partial (A^4 P) / \partial(ct) = (A^1 P)_{/1} + (A^2 P)_{/2} + (A^3 P)_{/3} + (A^4 P)_{/4}$$

This equation then incorporates the first two terms on the left of the Fokker-Planck equation.

$\nabla^2 (BP) = \nabla \bullet \nabla (BP)$ which can be represented covariantly as $(BP)^{/\mu}{}_{/\mu}$.

$(A^\mu P)_{/\mu} + (BP)^{/\mu}{}_{/\mu} = S =$ source/sink. This is still not in completely covariant form since we have not used the covariant derivative // which involves the Christoffel symbols in curved coordinate systems. When we do this, we obtain the following:

$(A^\mu P)_{//\mu} + (BP)^{/\mu}{}_{//\mu} = S$ which is now a covariant equation. We can now factor out the covariant derivative and obtain:

$[(A^\mu P) + (BP)^{/\mu}]_{//\mu} = S = J^\mu{}_{//\mu}$

$J^\mu = (A^\mu P) + (BP)^{/\mu} =$ transport flux or current density. This is slightly more general than other transport fluxes usually found and represented in irreversible thermodynamics, such as (again from Kittel):

$\mathbf{J}_x\, K_x = -\nabla W$

Ohms law: x = e and $K_e =$ electrical conductivity, W = electric potential, $\mathbf{J}_e =$ current density
Fourier's law: x = q and $K_q =$ thermal conductivity, W = Temperature, $\mathbf{J}_q =$ heat current density
Fick's law: x = m and $K_m =$ diffusivity, W = particle or mass concentration, $\mathbf{J}_m =$ mass or particle current density.

Again we get back to the current omission.

$J^{\mu} = A^{\mu} P + (BP)^{/\mu}$ = transport flux or current density as compared with
$d\,\xi_{(1)}{}^{\mu} / ds = a\,u^{\mu} + i\,b\,\varphi^{/\mu}$ = mass velocity vector

      This clearly shows that the mass velocity vector of this paper has the same covariant mathematical structure of a transport flux or current density as derived from the 4 dimensional covariant formulation of the Fokker-Planck equation. The author doubts that the mass velocity vector is related to probabalistic considerations, because, as was stated before, the author basically obtained the idea from Bernoulli fluid flow mechanics. It would be interesting to know in how many other venues this structural form for a transport flux arises, and what are, if any, the common characteristics they all share.

Omission 2:

      The derived Fermi constant FC was given as $q^2\,R_{oC}{}^2 = 1.419 \times 10^{-49}$ erg cm^3. When displayed in terms of the basic constants of nature we obtain the following equation:

$$FC = 2G_o \frac{h^2}{c^2}\left(\frac{M_w}{m_e}\right)^6$$

Omission 3:

      The predicted mass that CERN should find is 1118 times the mass of the proton and the
the mass of the proton 938.211 Mev or .938211 Gev.
1118 times 0.938211 Gev = 1048.92 Gev.

Omission 4:

      The author failed to pick up on a mathematical error on page 20. The math error consisted of $x\,\nabla$ instead of $\nabla\,x$ (del cross operator).

Omission 5:

      From page 23 of the manuscript:
(2) Consider why a photon does not travel at infinite speed. Also consider why an Olympic runner on flat hard ground can run faster than a man slogging his way through a swamp wearing heavy boots in eight inches of mud. Something is slowing the photon down giving it the appearance of having inertia. That something from Maxwell theory is the product of the free space permeability and permitivity constants. The ability of space-time to store electromagnetic energy gives an inertia to the photon, which resists an acceleration to a higher velocity.

      The author originally gave an example of the Olympic runner versus a man slogging through the mud. The author now replaces it with a much better, at least to this author, example. Consider two inclined planes of very hard wood. The second inclined plane has an extremely sticky fly paper glued to its surface. Take a 1 inch steel ball (remember that this is a thought

experiment) and roll it down the hard wood surface. This represents the greatest velocity achievable under the circumstances. Let this represent the photon with no interaction with spacetime. Now take the 1 inch steel ball and roll it down the inclined plane with the extremely sticky fly paper. It rolls down very very slow. Now take a 5 inch steel ball, and assume that its mass and rotational inertia are such that when it rolls down the inclined plane with the hard wood surface, it rolls down with the same speed as the 1 inch steel ball down the inclined plane with the sticky fly paper. This hopefully shows that the added inertia of the 5 inch steel ball over the 1 inch steel ball is the extra inertia given to the 1 inch steel ball by the sticky fly paper and hence shows why the photon cannot accelerate to infinite speed. Additionally, it is the author's opinion that this additional type of inertia given to the photon by spacetime is outside the aegis of the Higgs particle/field.

Omission 6:

The author has pondered weak and weary as to whether or not to add this sixth omission, as much of it borders upon extreme science fiction; however, isn't that how you mine gold and precious minerals? You just start grabbing whats valuable and meaningful and leave the rocks behind. Dear Reader, please do not be too hard on me for this Omission 6, as I am a naturally curious person regarding the anomalies that seem to inevitably occur in this very unnatural universe!

POSSIBLE APPLICATIONS, USES, EXPLANATIONS, ETC. OF THE NEW ELECTROMAGNETIC FIELD IN THIS PAPER

1. **Invisibility** (Remember that reflection is a photon bouncing off an object with inertia, thereby changing its momentum. What happens when the object it bounces off has no inertia?)

2. **Tractor Beam** (New e-m field with a push/pull to it.)

3. **Spontaneous Human Combustion** (Is the new e-m field associated with life itself? Has anyone ever seen the Virgen of Guadalupe image? Look at the rays, and they look very much like the pictures of the Kirlian aura coming from the fingers (please, I am very religious and absolutely no disrespect intended). If this is a new e-m life force field, then can it ever break down or short out? Would Spontaneous Human Combustion be the result?)

4. **Auras** (Why do painters of old times paint religious figures with halos around their heads? Could this be a manifestation of this new e-m field?)

5. **Ball Lightning**

6. **Levitation** ($m_{apparent} = (G/G_o) \, m_o$?)

7. **Multiple Personality Disorders in Psychology** (What if each person has his/her own e-m living field with your own experiences and memory attached. Upon the death of the physical body, this new e-m field survives (spirit, soul). What if a number of such living e-m fields

wanted to take over a body. They may all attach in some way to the weak interaction in every nucleon in the body giving a multiple personality disorder to the unfortunate person involved.)

8. **Paranormal Events (Poltergeists, Ghosts, etc.)** (Some people may be able to project the new living e-m field, which may be responsible for poltergeist effects. Are ghosts the left over living e-m field after the death of the body? Can ghosts manipulate our environment by moving objects by using the variable gravitational 'constant' or by interfering with lights by making them blink or turn on or off by using the magnetic monopole aspect of this new e-m field?)

9. **UFO's** (The author has absolutely no idea what UFO's are. Yeah, right!)

10. **Creation of matter of the same type** (feeding the 5000 using only a few loaves of bread and a few fishes?)

12. **Transposition of one element/substance to another element/substance** (changing of water to wine?)

14. **Dematerialization and Rematerialization** (There are documented reports of the materialization of rocks, rain, etc. in enclosed rooms in houses, which drive people crazy. What about BEAM ME UP SCOTTY?)

15. **Unexplained Falls of various substances in the open over large areas** (Falls of fish, blood, rocks, ice, etc. in various parts of the world, which are documented.)

REFERENCES

1. C. Kittel, *Elementary Statistical Physics*, John Wiley and Sons, Inc., New York, p. 157 (Third Printing, March 1964)
Kittel's reference is:
Ming Chen Wang and G.E. Uhlenbeck, Revs. Mod. Phys. **17**, 331, (1945).

2. G.G. Koerber, *Properties of Solids*, Prentice-Hall, Inc., Englewood Cliffs, New Jerseyk, p. 13 (1962).

3. Bissonnet, P. (2015) A New Perspective on Advanced Space Travel. *Journal of High Energy Physics,Gravitation and Cosmology*, **1**, 14-24.