

## The Generalized Equations of Motion<sup>1</sup> and the EPR

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It would appear that any question of "locality" or "non-locality" is primarily dependent on the validity of theories associated with the speed of light. There is the limitation imposed by relativity theory and some indication of superluminal speed associated with quantum theory. Because of our incomplete understanding of the fundamental laws of physics (hidden variables), such discussions can continue endlessly with no possibility of resolution. We will see that the answer has been obvious for the last hundred years<sup>2</sup>.

No one appears to have considered that both theories (with respect to the speed of light) can be supported.

### Relative Speeds:

Newtonian physics assigned only one relative motion for momentum and energy. In the case of energies associated with orbit, an expression for the total is derived (circular):

$$m_p m_s V^2 / 2(m_s + m_p) - m_p m_s G / r = -m_p m_s G / 2r \quad (1)$$

where  $V$  = sum of speeds of the sun and planet relative to center of mass,  $m_s$ ,  $v_s$ ,  $m_p$ ,  $v_p$ ,  
= masses and speeds of the sun and planet respectively.

from which, according to convention, the "proper" sum of velocities is derived.

$$V^2 = G(m_s + m_p) / r \quad (2)$$

However, we see that equation (2) is incorrect. The velocities have been initially defined and their sum **cannot be changed**. A pre-conditioned response determines the outcome. Because of the inverse proportionality of speeds with masses, (2) may be expressed:

$$v_p^2 (m_s + m_p)^2 / 2m_s^2 \neq v_p^2 (m_s + m_p) / m_s \quad (3)$$

Further analysis identifies the velocity  $v_k$  as being associated with total energy.

In special relativity theory, there is an uncritical acceptance of a velocity associated with momentum and a speed attributed to kinetic energy, with their relationship expressed by,

$$m^2 v_m^2 c^2 = m^2 v_k^4 / 4 + m m_o v_k^2 c^2 \quad (4)$$

where  $v_m$  and  $v_k$  are the respective motions

The Newtonian velocity is disregarded. However, a classical one-dimensional elastic collision between an electron and a mass-equivalent photon [ $h/c = m_x = m_o$ ] would result in a Newtonian velocity [ $v_n$ ] of,

$$2m_x c / (m_o + m_x) = v_n = c \quad (5)$$

A similar configuration in a Compton collision gives,  $c v_m = v_k^2$ . If the mass ratio is modified and/or a two-dimensional collision is introduced,

$$2m_x c v_m \cos \phi / (m_x + m_o) = v_n v_m = v_k^2 \quad (6)$$

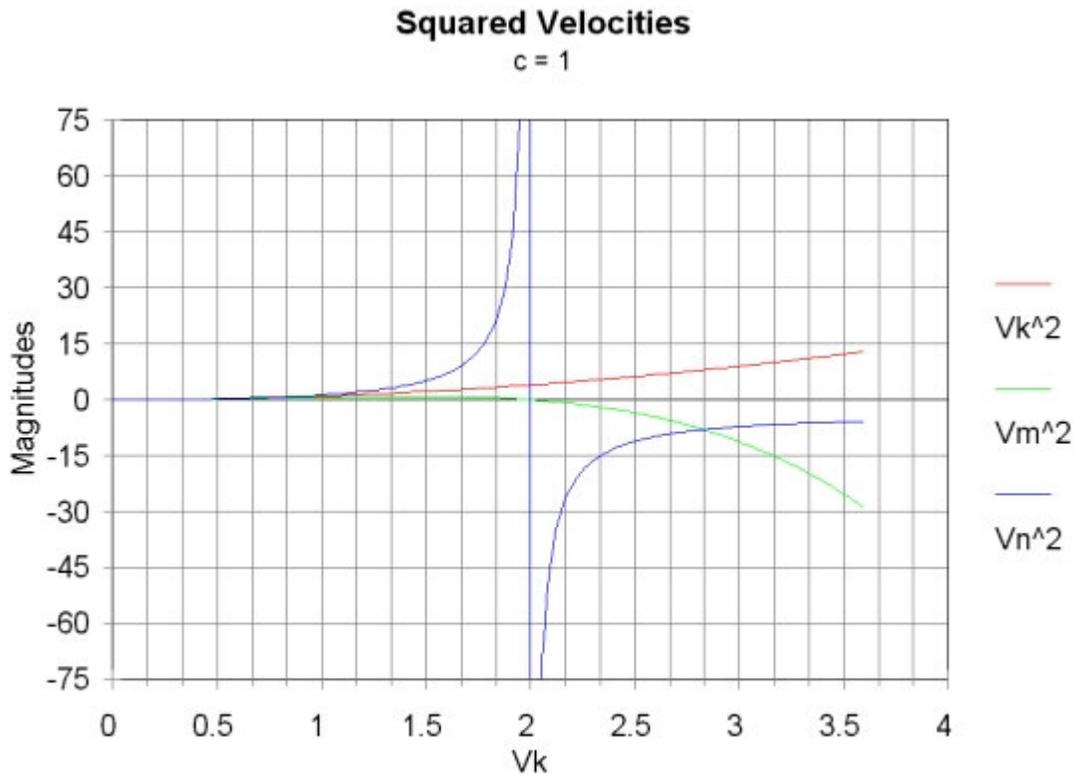
where  $\phi$  is the recoil angle of the electron. Subsequently, we can derive,

$$(v_m/v_n = (1 - v_k^2/4c^2)) \tag{7}$$

Equation (7) conforms to Dirac's relativistic treatment of the energy levels of the hydrogen atom and more importantly, provides an ontological basis for fine structure splitting of spectral lines. The velocity  $[v_n]$  is implicit. It would appear that classical mechanics has not been supplanted, but obscured. Furthermore, the velocity associated with total energy is explicitly defined in the square of the velocity  $v_k^2$ . Since this is equal to the combined linear velocities, an immediate explanation for its scalar attribute is also identified. Furthermore in this context,  $v_n$  is defined as the velocity associated with inertia, in angular opposition to  $v_m$ , as obviated by the absence of any vectors in the relativistic equations of motion.

In an elastic collision, the force vectors would be precisely equal, and presumably the same would apply to inelastic collisions when internal energies are taken into consideration (conservation laws). The principle of "equivalence" is no doubt dependent on this interpretation.

The question arises as to what limits may be imposed on the three speeds? This was explored by plotting the squared velocities as a function of  $[v_k]$



As  $v_k$  approaches  $2c$ ,  $[v_n]$  approaches infinity and  $[v_m]$  approaches zero. At precisely  $[2c]$ , there is an abrupt cessation of all linear motion and then a reversal of speeds beyond that point. (The existence of angular velocity at this point suggests particle spin.) This is analogous to behavior at the repulsive core of the atomic nucleus.

Of significance is the existence of the velocities,  $c$ ,  $2c$  and infinity in direct correspondence with the results of the Pappas-Obolensky experiments. Equally important is the included statement, "for the

coaxial line to operate at the superluminal velocity... it was necessary not to be near bulky objects or the ground and not to undergo sharp bends..." From this we may conclude the obvious; that impedance or the presence of mass limits the velocity. Velocities beyond those indicated do not appear to be significant although the absolute values are all equal at  $8^{1/2}c$ .

The EPR thought experiment gains credibility, at least to the extent that it is dependent on the existence of superluminal speeds.

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<sup>1</sup> On a suggestion from Dr. E. H. Dowdye, I propose the relativistic equations of motion be referred to by the title of this paper, to differentiate from their use in relativity theory.

<sup>2</sup> This paper is comprised of excerpts from the following:

The Synthesis of Quantum Electrodynamics, Special Relativity and Classical Mechanics, Walter Babin, Published, International Scientists Club, St. Petersburg, RU.

<http://wbabin.net/babin/wd6.htm>.

The Theoretical Basis for Superluminal Speeds and Superconductivity. Walter Babin. Feb. 2003

<http://wbabin.net/babin/super.htm>

An Analysis of the Theoretical Foundations of 20<sup>th</sup> Century Physics, Walter Babin, May, 2009

<http://wbabin.net/babin/analysis.pdf>