

The Creation of Mass –
An Alternative to the Higg's Mechanism.

Peter G. Bass

Abstract

Based upon an extension of Einstein's Special Theory of Relativity, this short paper presents a new hypothesis for the physical creation of mass in relativistic space-time, as an alternative to that in the Standard Model of particle physics represented by the Higg's Mechanism.

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1.0 Introduction.

Very briefly, in the Standard Model of particle physics, the creation of mass is purported to be due to the interaction of 'particles' with the Higg's Field. The Higg's Field is a quantum field said to pervade all of space. The field itself is not measurable but via quantum excitations is said to generate the Higg's Boson. The mathematical description of this process is an extremely complex one.

In nature it is believed that the reality of existence should be as simple as possible, a concept which should apply equally to the creation of mass. Accordingly, an alternative has been constructed, based upon an extension of Einstein's Special Theory of Relativity, as mathematically re-formulated in [1].

It was shown In [2], that the hypothetical application of a 'temporal force' to a material particle, did not result in that particle 'travelling' along the temporal axis, (travel in time), but instead caused it's mass to increase or decrease according to the direction in which the force was applied. This concurred with the result in [1], in which the application of a spatial force to such a particle caused its mass to increase as its Existence Velocity Vector was rotated into the spatial domain, and this was shown to be the manner in which kinetic energy was stored. This suggests that the rest mass of a material particle may simply be the storage of 'temporal kinetic energy', due to the effective motion of the particle through the temporal dimension.

In order to fully appreciate this paper it is important that at least reference [1] is read first.

2.0 Descriptive Preamble.

To investigate this suggestion in detail, it is necessary to consider a hypothetical situation in which a quantum of energy possesses an effective temporal velocity less than that of the full velocity of temporal space, (i.e. the velocity of light in a vacuum devoid of a gravitational field).

Due to its existence in, and motion through, temporal space, the energy quantum would be subject to a naturally imposed force, similar to that proposed in [5]. This would result in an acceleration of it in the direction of flow of temporal space, from the 'future' to the 'past', so as to increase its effective temporal velocity, to that of its temporal surroundings. In doing so the energy quantum would be imbued with the attribute of mass. This hypothetical situation is shown below in Fig. 1.

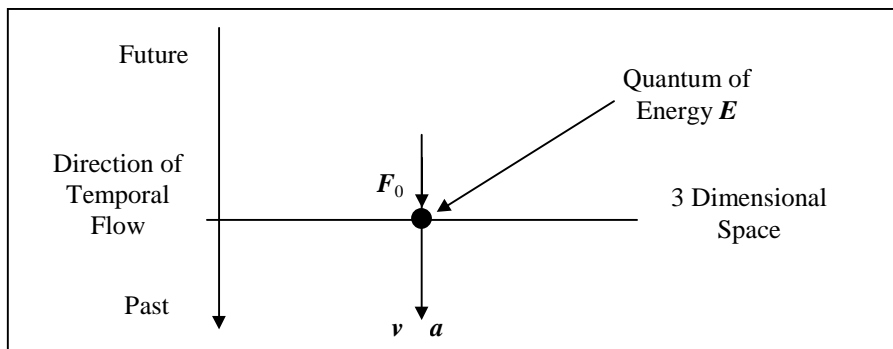


Fig. 1 – Temporal Flows in the Creation of Mass.

In Fig. 1 the terms are defined as follows:-

- E – A quantum of matter energy.
- F_0 – A force imposed on the energy quantum by the motion of the Temporal Dimension.
- v – Effective temporal velocity of the energy quantum.
- a – The temporal acceleration of the energy quantum.

Other terms will be defined as they are introduced.

The force F_0 is proposed to exist as a result of temporal dimensional space, possessing a physical attribute similar to the 'elasticity' of normal three dimensional space as described in [5].

Analysis of the resulting creation of mass observed in the spatial domain is then pursued as follows.

3.0 Analysis.

The power generated by the applied force F_0 on the energy quantum, would be given by the product of F_0 and c the velocity of temporal space, i.e.

$$P_0 = jF_0c \quad (3.1)$$

The reactive power generated within the energy quantum must be given by its energy multiplied by a function with the dimensions of inverse time. Therefore let this reactive power be

$$R_0 = jE \left(\frac{da}{dx_0} \right)^{1/2} \quad (3.2)$$

where dx_0 is an element of temporal space, and j is the usual complex plane unit vector.

Equating (3.1) and (3.2) and squaring

$$F_0^2 c^2 = E^2 \frac{da}{dx_0} \quad (3.3)$$

with $\frac{da}{dx_0} = \frac{da}{dt} \frac{dt}{dx_0}$ (3.3) becomes

$$F_0^2 c^2 v = E^2 \frac{da}{dt} \quad (3.4)$$

Multiplying both sides with the integrating factor $2 \frac{dv}{dt}$ gives

$$2F_0^2 c^2 v \frac{dv}{dt} = 2E^2 a \frac{da}{dt} \quad (3.5)$$

Which integrates to

$$F_0^2 c^2 v^2 = E^2 a^2 + k \quad (3.6)$$

When $v = c$, $a = 0$ so that $k = F_0^2 c^4$ which when inserted into (3.6) gives

$$F_0^2 c^4 - F_0^2 c^2 v^2 = -E^2 a^2 \quad (3.7)$$

Which reduces to

$$F_0 \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} = -\frac{E}{c^2} a \quad (3.8)$$

On the LHS is a force and by Newton, force = mass times acceleration. Therefore on the RHS the term E/c^2 must have the dimensions of a mass, (i.e. in accordance with Einstein's equation $E = mc^2$). Thus

$$F_0 = -\frac{ma}{\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}} \quad (3.9)$$

and writing this as

$$F_0 = -\frac{mv \frac{dv}{dx_0}}{\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}} \quad (3.10)$$

and integrating

$$E_0 = F_0 \int dx_0 = -m \int \frac{v dv}{\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}} \quad (3.11)$$

With the usual substitutions $v = c \sin \phi$, $dv = c \cos \phi d\phi$ and $\left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} = \cos \phi$, (3.11)

integrates to

$$E_0 = -mc^2 \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} + k \quad (3.12)$$

As E_0 is the energy imparted to the energy quantum by the force F_0 , then when $v = 0$, $E_0 = 0$, so that $k = mc^2$. This gives

$$E_0 = mc^2 \left[1 - \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}}\right] \quad (3.13)$$

and this is clearly the equation of relativistic kinetic energy, (in this case along the temporal axis). Consequentially, when $v = c$, i.e. when the now particle mass has been accelerated to the same temporal velocity as temporal space itself, then

$$E_0 = mc^2 \quad (3.14)$$

In this case E_0 is now the total energy imparted to the matter particle as its temporal velocity is increased from $v = 0$ to $v = c$. This energy is then stored by the particle as mass m . The concept is therefore identical to the manner in which spatial kinetic energy is stored by an artificially accelerated particle in the spatial domain. The term 'rest mass' is attributed to m ($\equiv m_0$), because there is no spatial motion.

Also note from (3.8), that Einstein's famous mass – energy equation should really be written

$$m = \frac{E}{c^2} \quad (3.15)$$

because m is the derived parameter, from E , the elementary parameter.

4.0 Conclusions.

The hypothesis proposed here has merit in that it is based upon an existing theory, the Special Theory of Relativity, as mathematically re-formulated in [1]. Furthermore, it exhibits the same feature as in that theory, the relativistic increase in mass due to a spatial velocity, in this case along the temporal axis.

The proposal uses only one assumption, in that temporal velocity is constant and stable. This is evidenced in its immediate use in (3.1), and is not thereafter subject to variation throughout the analytical process. However, this raises the question as to how a quantum of matter energy can exist in three dimensional space at a temporal velocity v , less than that of temporal space itself, i.e. c . There is no definitive answer to this question, only a somewhat speculative one. It is suggested that at some cosmologically undefinable time in the past, before even the creation of this Universe as delineated in [3], the velocity of temporal space was zero. Consequently, time in three dimensional space did not exist. There was no motion, and the only energy that existed was quantum matter energy which was totally static. Then, due to some unknown process, temporal velocity was 'kick' started, particle mass was created from the quantum matter energy, as proposed in this paper, giving rise to the most elementary sub-atomic particles. Development from these then proceeded in much the same manner as is proposed in main stream cosmological theory, leading to the accumulation of ponderable masses together with their associated gravitational fields as proposed in [4].

However, this then raises a further consequential question as to what is the source of the quantum matter energy, in such a static cosmos as described above. This question is similar to that frequently posed concerning the source of everything, in the main stream 'Big Bang theory' of the origin of the Universe. These questions do not even have a speculative answer, and quite possibly, never will.

References.

- [1] P.G.Bass, *The Special Theory of Relativity – A Classical Approach*, www.relativitydomains.com.
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- [5] P.G.Bass, *Gravitation – The Inverse Square Law Anomaly and its Resolution*, www.relativitydomains.com.