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Matter In The Universe

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Abstract: **We introduce the term "grey matter" to the mass involved in Special Relativity, similar to our mind, which has no inertia, although it generates energy; this mass, derived from electric charge, is electromagnetic and virtual in nature and assumable by Quantum Theory, but not by Classical Mechanics.**

The matter itself, ie, that which corresponds to a real or inertial mass, is produced under the strong, weak an electromagnetic interactions, based on coupling constants (charges) and potencials; thus, tangible objects with constant mass acquire the consistency they need to generate inertial forces, in accordance with the laws of Chemistry and Classical Mechanics.

The Universe contains two kinds of matter:a) the grey one, which is the only information we have of stars, galaxies and other objects through the radiation we receive and it may also account for the so-called "dark matter"; b) the true matter, originated in stars and responsible for gravitation, whose extremely small intensity (relative to the other three forces) only allows having a similar scope of our Planetary System.

The failure in the unification of the Special Relativity with Classical Dynamics, makes the General Theory like a set of definitions and identities, converted into laws by imperative of mathematical rules based on differential geometry (tensors or manifolds), where the curvature of spacetime becomes an "absolute", pretending generate interaction governing the world as a whole, but supported by some experimental evidence of little or no reliability.

Keywords: Matter In The Universe **similar to our mind, which has no inertia.**

1. INTRODUCTION

The obsession with the term "absolute" that has been driving since the implementation by Newton's laws of Physics, in his controversy with Leibniz and resumed in the nineteenth century by Erns Mach in his criticism of the laws of mechanics is just the starting point that led to the Theory of Relativity, so that Philosophy has joined the debate surrounding all Modern Physics in its theoretical dimension.

What is an absolute?; although it is a philosophical question linked to the Theory of Knowledge, it seems the Physics has been introduced therein from the formulation of the Special Theory of Relativity, based on an indisputable fact: the constancy of the speed of light in vacuum, whose value is independent of any reference system from which can be measured, ie, i turns out an "absolute" value.

The measurement is the central axis on which the certainty or not of a theory rests an experiumental science, so that if you lose sight of this condition it may be reached to totally wrong conclusions; this is just what we believe has been occurring in Modern Physics, because of Special Relativity and consequently to the General.

The game carried out in both theories is well plotted, so that mathematical and physical concepts are closed as a loop, ie, the reasoning is like what in Philosophy is named as a "tautology".

Thus, in the Special theory, it refers to moving frames as inertial system, as this is only one of an infinite number, so that the constant velocity serves as a pivot for establishing the proper time and rest mass as a constant values. The same happens with the General one, about accelerated systems, which becomes another "absolute" to make it coincide with the gravity acceleration, so this will be the last reference that account of the general law to be govern the Universe as a whole.

The problem in both cases is that it is not possible to articulate any experimental methods to carry out the measurement corresponding to the physical quantities involved from different equivalent systems, as it is only possible to make the experience from one system, the fixed one, while over the moving, a constant value is set (Interval), given by definition as a necessary condition of the construction.

However being a skilfull construction, which from the outset was given to objections like that of Krestschman en donde the covariant theory appears as empty of content; in those first decades of the past century some data seemed to give reason to it, but now, with the knowledge that provides the construction of Quantum Field Theory, we think it turns out been appropiated to bring up such objections.

Grey matter:

The approach of the Special Relativity Theory and the comments raised are being done in reference to the General one; in this regard, the crucial point thereof, that is, the concept of Interval is usually defined so that the accelareted systems are excluded locally, but they must appear as a "logical" continuation of the same.

We try to make an analysis of relativistic formulation, but taking into account the physical meaning behind the well-known mathematical expressions.

A) **Intervals:**

All the mathematical relations between the coordinates (t, x, y, z) and (t', x', y', z') from the corresponding reference systems, end up just reduced to the relationship between the paths traveled by light and the test body located in the moving system with velocity, v, through the definition of Interval, ds:

$$ds^2(\text{const}) \equiv c^2d\tau^2 = c^2dt^2 - dx^2 - dy^2 - dz^2 = c^2dt^2 - \mathbf{r}^2 = c^2dt^2 - v^2dt^2 \quad ===>$$

$$dt = d\tau/\sqrt{(1-v^2/c^2)} \qquad (1), \quad \text{where} \quad \boldsymbol{v} = d\mathbf{r}/dt = \text{const} \quad ===> \quad d^2\mathbf{r}/dt^2 = 0$$

The inclusion of the law of **inertia** under the constancy of the velocity, v, is apparently correct, since the necessary state of rest mass would be supported by the "observer" placed on the moving system (O'), for whom such speed would be zero, v = 0, in which case the only event to consider is the propagation of light that is physically manifested by the space covered by it, $cd\tau$, to be also assumed by the "observer" on the fixed system (O), for whom speed, v is not zero.

The velocity "paradox" is transferred to that of the time, so-called "twin paradox"?

But let's look at the issue from another perspective. The mass involved is related according to a similar time dilation expression, ie, $m = m_o/\sqrt{(1-v^2/c^2)}$ (2), so that its interpretation should be done in the same way: the mass must be linked to momentum, p, in the same way as it is the time with the space traveled by the electromagnetic wave and the body linked to moving system; in other words, distance and momentum are physical variables that behave identically. Therefore, we will have

$$m = m_o/\sqrt{(1-v^2/c^2)} \quad ===> \quad m^2c^2 - m^2v^2 = m_o^2c^2 = ds^2 = const. \qquad (3)$$

The analysis of this expression allows us to point out that the only constant empirical parameter is c, while v is montaneous constant by construction, as allowing an infinite number of moving systems, we could see that when it is considered $v' > v \; ==> \; m' > m$; otherwise m_oc would not be constant, according to (3).

However, it should be possible to have $m' = m$, implying that m_o decreases, in which case (2) should be formulated $m_o = m\sqrt{(1-v^2/c^2)}$; a mass of theses features, ie, m = const would corresponds to m_o decreasing indefinitely.

Bu this behaviour requires that the expression (3), is not actually an "equation", but an **identity,** in which case the **speed**, v can not be **null,** ie it is not possible to get the situation where $m = m_o$ and therefore there will not be mass at rest; in other words, the introduction of an "observer" in the moving system is not possible.

For the same reason it is not correct to assign m_o to the mass of the electron, as it is required to be measure with a speed; otherwise how could act the magnetic field?

It is easy to transform the expression of the momentum (3) in the well-known Energy "equation", which in the Minkowski spacetime turns out to be the four-momentum, $p \equiv ds$, ie. the Interval (constant); for this end we have to multiply by c^2:

$$(mc^2)^2 - c^2(m\boldsymbol{v})^2 \equiv (m_oc^2)^2 \quad ===> \quad ds^2 = p^2 = E^2 - c^2\mathbf{p}^2 \equiv (m_oc^2)^2 \qquad (4),$$

according to that shown above, this is an **identity**, since using m to define $E = mc^2$ y $\boldsymbol{p} = m\boldsymbol{v}$ is obtained directly m_oc^2 by a simple algebraic operation and **not** being an **equation**, can not be accepted, $\boldsymbol{p} = 0$, since in that case everything will disappear.

Therefore, we should only use (4), considring the Interval, ds, as a mere constant.

Actually, m and m_o and also dt and $d\tau$ can not be displayed (measured) simultaneously; in other words, the time, $d\tau$ and the mass, m_o are contained in the quantities likely to be measured, such as the time, dt, and the relativistic mass, m. This is the true physical meaning of the relationships (1) and (2) and why the development of the same results in "identities".

On the other hand, if you look at the physical quantities related to theses masses, $m\boldsymbol{v}$, mc, m_oc, we see that only the first might be consistent with the concept of momentum of any tangible body: what can we say about the momentum the other two if no bodily or inertial mass can reach the speed of light?. This, together with de impossibility of having a "rest mass", authorizes us to state that such **masses** should **not** be **inertial** and the name given to moving systems of "inertial" is inadequate.

Therefore, the only way to admit the momenta (mc and m_oc) is regarding the **masses** as **electromagnetic** and **virtual** nature, which will also apply to $\boldsymbol{p} = m\boldsymbol{v}$ and $E = mc^2$.

In that case, the concepts of "energy content" and "mass-energy equivalence" are redundant and as for the "inertia of energy" is not correct as we have just demonstrated.

B) **Mass and Quantum Theory:**

Theses masses can be perfectly assumed by **Quantum Theory**, but not **Classical Dinamics.**

In this sense, the mass (introduced ad hoc), m_oc^2, may be considered as the minimum energy of the system, which can be associated to "vacuum"; from it will be able to extract the energy, mc^2, under the many-particle method used in Quantum Field Theory for *bosons* (Klein-Gordon equation) and electrons or *fermions* (Dirac equation).

In addition, the laws of Planck, $E = \hbar w$ and De Broglie $\boldsymbol{p} = \hbar k$, ($\hbar$ is the Planck's constant , w, the frequency and k the wave number of the electromagnetic radiation) appear in a natural za logical way, as well as the wave-particle Duality of photons and electrons, where the mass acts as a decisive factor in its electromagnetic and virtual nature:

$$E = mc^2 = \hbar w; \qquad \boldsymbol{p} = m\boldsymbol{v} = \hbar\boldsymbol{k} \quad (5).$$

However, it should be noted that this is against the "mainstrem of current thinking" in the sense, you can find at the literature statement about that (4) "must be committed though the particle is massless"!.

An electromagnetic an virtual mass can have entity, if it is derived from **charge,** e**,** either direct or indirectly; considering the the charge of electron is "quantize" it is appropriate for defining the **unit** of **mass** in Particle Physics, Electron-Volt: $eV \equiv mc^2$ (6), which actually, becomes the "true" expression of the "mass-energy equivalence".

The role of "charge" as origin of mass is also evident in the physical quantity resulting from the conservation law in the so-called Gauge Symmetry.

The same occurs with the appearance of positron or electron antiparticle, whose negative energy corresponds to the sign (positive) of its charge; the term *antimatter* is inappropiate for two reasons: a) its electromagnetic and virtual mass; b) the negative energy may be converted into positive by a reformulation of relativistic equation, admitting the possibility of speed exceeding the velocity of light, as we have done in our article: "**Tachyons and Modern Physics**" (International Journal of Scientific&Techenology Research. Volume 4, issue 12. December 2015).

Moreover, with our interpretation of electromagnetic and virtual mass it turns out understandable the integration of variables dynamics like Energy and Momentum under (4) in the "phase space" according to $(wt\text{-}kx) \equiv (Et - c\boldsymbol{p}.\boldsymbol{r}) = (Et - cpx) \Longrightarrow w/k \equiv E/p = c$, that becomes a continuation of (5), which, in turn, is in line with (4).

In addition, theses masses act in the interaction process:

Pair Annhilation: e^+ *(positron)* + e^- *(electron)* ------> (γ) *gamma rays*

Pair Creation: $\gamma + \gamma$ ----> $e^+ + e^-$

Compton Effect: $e^+ + \gamma$ ----> $e^- + \gamma$

Thus, the first is significant in that the disappearance of the two leptons (*positron and electron)* imply the assumption of photons with their masses, according to $E = mc^2 = h\nu$ as already indicated in (6); thus, we would solve the problem of considering a massless radiation (photons at rest), but with non-zero mass (moving).

Although are usually represented by the so-called "Feynman Diagram" and treated mathematically by four-momenta, in the end are reduced to energies balance using the relativistic mass, mc^2.

Finally, we think it is not necessary to explain that the term **grey matter** given to relativistic mass is due to the **virtual** and **electromagnetic** nature of it, ie, something "incorporeal" like our "mind"; the variability of the masses is consistent with the frequency of radiación and corresponds to the "imprecision" in the play of light and shadow, which may cover the "dark matter", as we shall see later. The accuracy is produced by atomic structure, which provides the necessary condition for the existence of inertia, as it will be explain in what follow.

True matter:

The great "success" of Special Relativity is found in the introduction of the mass with the constant *c*, as this may explain the high energies involved in Particle Physics, although this mass is "virtual"; but the precipitate development with the formulation of the General, without taking into account the new Physics that emerged in those years, that is, Quantum Theory, led to the "error" to consider the mass as "inertial", despite being linked to an unattainable speed, c, by any ordinary body.

But the most surprising is that this interpretation has not changed after the formulation of Strong and Weak Interactions, which cause the composite particles or *Hadrons* and *Atomic Nuclei,* with the help of Electromagnetic Interaction.

It is easy to note that a cursory analysis of **Strong Interaction,** gives the key for getting the **true** or **real mass**: it is the phenomenon called "confinement", which does not allow *quarks* to go outside or "exterior space". This, coupled with the strong cohesion provided by the interactive network of *gluons* (massless), so that the attached mass to *quarks* is negligible compared to the *hadron* final mass, which is in line with all developed above, in the sense that they are only fractional charges of the *electron* and its **masses** should be **virtual**.

The only stable *hadron* is the **proton,** composed of three *quarks, u (+2/3), u (+2/3), d (-1/3),* so that its charge will be $q_p = +1$, while the **neutron** *(u, d, d),* has no charge, $q_n = 0$, and is unstable, but its decay always leads to *proton,* so that both may reach a compromise and unite to form the atomic nucleus; in it both are called *Baryons* or *Nucleons* and their masses are equal in atomic mass units (*amu),* which is the true source of the **true matter,** provided with real or inertial mass, constant, as it is handled in the laws of Chemistry and Classical Physics.

However, both particles have different masses in eV units: m_p = 938.2 MeV, m_n = 939.5 MeV, which shows that *neutron* is in a higher energy level, thus explaining its instability and its tendency to become *proton,* through the beta decay: $n + \nu$ *(neutrino)* ---> $p + e^-$.

The energy involved is purely electromagnetic, as the opposite process, that is, the β^+ decay: $p + \nu^*$ *(antineutrino)* ---> $n + e^+$ is only feasible when the proton raises its energy level, thanks to its charge and the suitable potential; this is in line with the concept of electromagnetic and virtual mass for electrons and positrons.

NOTE: We have placed *neutrinos* and *antineutrinos* on the left side, indicating that these particles can not go out, but remain in the "inner space", ie, do not exist, as we have tried to show in our previous work: "**Elementary Particles**: **A New Approach**" (International Journal of Scientific&Technology Research. Volumen 4, issue 07, July 2015).

All other *Hadrons* have an ephemeral existence, as is found in their decay perios on the order of an average of 10^{-10} s; therefore, the involved *quarks (charm, strange, top, bottom)* that contribute to the formation of them, are to be joined by absorption and emission of "gluons" over "color charges" of the *quarks,* so that the persistence of Strong Interaction is now very volatile, ie, not lasting.

These Particles will have electromagnetic and virtual masses, since to be associated with inertial mass, ie consider them as tangible and consistent bodies is contrary to that instability.

As for *Protons* and *Neutrons* , stability is achieved thanks to **Weak Interaction,** that recently is very well-known by the media on account of the so-called Higgs Boson obtained in the experiment conducted at the Particle Accelerator

LHC; receives that name, because such "interaction" is explained by Higgs Mechanism, based on Gauge Symmetry and takes place through the incessant exchange of W^-, W^+, Z *bosons*, causing the **weak force** that binds the two *baryons or nucleons* (protons and neutrons), forming the atomic nuclei.

Naturalely, with our interpretation of electromagnetic and virtual mass for all elementary particles (*bosons or fermions)* and the consideration that those masses are derived from the charges involved in interactions, we will see that the Higgs Model is "redundant".

To this end, lets's see the Lagrangian density, which is formulate from the Klein-Gordon equation for *bosons:*

$$\mathcal{L} = \frac{1}{2}\partial^\mu\phi^+\partial_\mu\phi + \tfrac{1}{2}m_o{}^2(\phi^+\phi) - \lambda/4(\phi^+\phi)^2 \quad (7)$$

where the first term is the kinetic part, while the others are considered the potential energy of the system.

We can explore the kinetic behaviour by arbitrary phase transformation over the complex fields, ϕ^+, ϕ from global and abelian symmetry group U(1) = $e^{i\alpha}$, corresponding to electromagnetic field; this, when applied to Lagrangian equation introduces the potential A_μ, so that derivative, ∂_μ becomes the Covariant, $D_\mu = \partial_\mu + ieA_\mu$, wherein the electromagnetic interaction appears explicitly, eA_μ.

Using SU(2) group as a generalization of U(1), we will have the non-abelian and "local" transformacion $\exp(i\alpha_\mu^a A_\mu^a)$, where A_μ^a are the "generators" of SU(2) group, which as Potential Gauge should fit the Lie Algebra, $[A_\mu^a, A_\mu^b] = i\epsilon_{abc}A_\mu^c$ (8) and with them we may get the Covariant derivative, $D_\mu = \partial_\mu + ig\alpha^a A_\mu^a$, (9), where $g\alpha^a$ represents the coupling constant or "weak charge", while A_μ^a is like a conection in the "inner space" of such charges.

Then we proceed to the formation of the SU(2)xU(1) Group, consisting in a new "rotation" between the potential A_μ^c, belonging to the SU(2) group with the potential A_μ, included in U(1) group, getting

$$Z = -A_\mu sin\theta_W + A_\mu^c cos\theta_W; \quad A = A_\mu cos\theta_W + A_W^c sin\theta_W \quad (10)$$

The empirical value of the "weak mixing angle", θ_W, is given by $sin\theta_W = 0.222$, which it allows the coupliong constants relate to each other and with electron charge:

$$g = g'tg\theta_W; \quad g = e/sin\theta_W; \quad g' = e/cos\theta_W \quad (11).$$

Finally, the energies involved in the interaction can be obtained directly by the Kinetic part of (7), through the fenomenológical Equation introduced by Fermi, which in its simplest form,

$\mathcal{L} = G_F/\sqrt{2})\, J.J'$, (12), where $G_F = 1.2x10^{-5}/m_p^2 = 1.66x10^{-5}$ GeV and J, J' are the "weak currents", which may be identified with the coupling constants or "weak charges", g, g'.

This makes it easy to get the energies correspoding to W^- and W^+ particles:

$E^2 = \sqrt{2}\, g^2/G_F$ ===> $E \approx 37.3\, g = 80$ GeV, whereas respect to *Z*, we must use the two constants, g and g' so that $E^2 = \sqrt{2}\, g\, g'/G_F$ ===> $E \approx 37.3\, g/cos\theta_W = 90$ GeV.

As we can note, the energies are given en terms of Scalar Potential: $A_o^a = A_o^b = Z \approx 37.3$ GV and "weak charges" or coupling constant, g for A_o and $\sqrt{(g\, g')}$ for *Z*.

Higgs mechanism, very elaborate, aims to give prominence to relativistic mass of the gauge particles, since they are being considered as inertial; how can be admitted that particles acting as bosons, ie, in an unlimited number which last 10^{-18} s may be provided with inertia?.

But, as we have shown, the masses attributed to "gauge particles" are no parameters to be justified by Potential Energy in the Lagrangian (7), since they are considered derived from "coupling constants" or "weak charges" and as such they should be of **electromagnetic** and **virtual** nature. For this reason, we have stated earlier that the Higgs Mechanism is "redundant".

The "virtual" and "electromagnetic" nature of Particles Gauge's masses associated with high energies are necessary to give consistency to atomic nuclei, wich is the condition required by **real matter** to have **inertia;** in other words, weak forces, superimposed on strong forces, constitute the "force of inertia", which tend to oppose to any external force under bodies.

In this way, it can be explained the constant **mass** of atomic nuclei and therefore of atoms, molecules and macroscopic substances that can be formed with them.

Matter of the Universe:

General Relativity Theory is built from the Special by introducing accelerated systems of references, to which the physical law of gravitation is linked; at first sight, that decision seems very logical and natural, since gravity is a long-range force and has no limitation as electromagnetism of being screened.

But it was long before even remotedly suspect the existence of four types of forces, whose intensities are of the order of magnitud: a) strong interaction, 10^{1}; b) electromagnetic interaction, 10^{-2}; c) weak interaction, 10^{-5}; d) gravity interaction, 10^{-40}, which is extremely small compared to the other three.

Under these empirical data, it is clearly understood the integration of electromagnetiic, weak and strong interactions in Quantum Theory, but it makes no sense to admit that gravitation could be unified with electromagnetism and end up imposing over all interactions.

It is for this reason, so far it has not been achieved the gravitation "quantization", although much effort has been dedicated to this task in recent decades; this fact, is consistent with the inability to unify Electromagnetism and Dynamics Classic, as we have shown above, although in such attempt it was designated a priori to moving systems as "inertial", based on a nonexistent "rest". With a similar purpose, General Theory introduce accelerated systems, which are linked to "inertial forces" related to gravity.

All this justified by the implementation of "absolute", represented by physical laws, so you get to the strange situation that an experimental science becomes a "touchstone" of philosophical arguments. Let's see how it is proceeded:

A) **Approach**:

Instead of defining reference systems with constant velocity, v, now we have accelerated frames, C, and a body test, m, with an acceleration, a, which respect to C will be, a_C , so that must be subjected to a force, $F_C = ma_C$; in this condition the total force computed must be null: $F = ma + ma_C = m(a + a_C) = 0$.

If the acceleration, a, is identified with gravity, g, $F = m(g + a_C) = 0$ ===> $mg = - ma_C$, where the force $F_C = - ma_C$ appears contrary to the gravity force, mg, ie, similar to that of static equilibrium, so that it will corresponds to Centrifugal Force and presented itself as "real", in accordance with postulated by Mach. Thus, it is being considered as "inertial force" and for an "observer" placed at the accelerated frame, the instantaneous acceleration will be zero, since the total force is considered as "real", $F = 0$.

It is easy to note the "artificiality" of the approach and the weaknes of the previous argument, since it is "arbitrary" the choice of a total force, $F = 0$, and th existence of a centrifugal force, as "real" should not be not appropriate.

Thinking about it, we can find that is, actually, "definition" or "identity", as the correct approach of the accelerations, a, a_C relative to one another, would require the relationship:

$a_C - a$ ==> $a_C - g = 0$, and directly: $ma_C = mg$, which is merely the second newtonian's law, where the force produced by gravity, $f \equiv mg$, causes the centripetal force, $F_C = ma_C$.

This shows that the attempt to reach the null acceleration, through a "total" force, $F = 0$, in order to justify that a "fictitious" force, such as the centrifugal, becomes a "real" one, is merely a mathematical "game", whithout physical meaning.

The same could be said regarding the removing of mass, m, as the "cause" or origin of the interaction, under the identity (equivalence) between the gravitational mass and the test body.

Actually, the "construction" becomes similar to that of the Special Theory with **moving frame**, where we could see that variables or physical magnitudes, such as masses and times might only be measured from the fixed system; now, to put ourselves in the **accelerated frame**, it happened the same with acceleration and therefore the force, which can only be considered from the fixed system, as we try to prove with what follows:

1) In the example of the "lift" that falls freely, the cancellation of the acceleration for the test body is momentary null and respect to the lift, but this not prevent the body remains subject to the gravitational force, so it can not draw any conclusions.

2) However, in the rotation movements, the tangential velocity, *v*, realizes dynamics properties, such as the centripetal force, $F_C = mv^2/r$, perpendicular to that the body located at the satellite isa subject to gravity, *g*, although smaller than that in the surface of the Earth; this speed, unlike those introduced in Special Theory, correspond to "inertial" systems, so that if it is desappeared the causing force, ie, *mg*, the body provided with the same constant mass, *m*, would continue its movement in the direction marked by the velocity, v, that is, tangent to the curvilinear trayectory.

3) Moreover, taking up the issue from an empirical point of view, how admit that the widening of the rotating Earth is due to the attraction of distant stars, despite the enormous distant and the extreme smallness of gravitational intensity?; it is unthinkable in an experimental science, especially when it has been overlooked that the true strength of inertia is in the Geosphere, as we have tried to show in our previous article: "**Star**: **A New Approach**" (International Journal of Mathematics and Physical Research. Vol 3, Issue 1, pp: 189-196. Month: April - September 2015, available at: www.researchpublish.com)

B) **Development:**

The General Theory is based on the assumption of considering the accelerated frames as the cause or origin of dynamic phenomena; in other words, Geometry becomes the "instrument" that Nature must use to carry out the "interactions" to which the bodies are subjected at global or cosmic scale: hence the term "Geometrodynamics" by which it can be summarize the formulation of the theory.

We must take into account that in the introduction made above, *g*, is not constant, then any formulation can only be done in a infinitesimal space, ***dr***, which will become presently in the Interval, *ds*, whose general expression is $ds^2 = g_{\mu\nu}x^\mu x^\nu$, where $g_{\mu\nu}$ the metric is now variable, ie, depending on the coordinates (*t, x,y,z*)**,** so they becomes curvilinear, while in Special Theory, the metric is constant and rectilinear, representing the Lorentz transformation, to which is adjusted Quantum Field Theory.

There is a radical difference between the Lorentz transformation, ie, in the Interval, *ds*, involving the relationship for time (1) and (2) for mass, with rectilinear coordinates and that corresponding to the General formulation, where the metric, variable, leads to the appearance of curvilinear coordinates, that in the inmediate geometric case corresponds to polar coordinates, (r, ϕ, φ) which replace (x, y, z).

First, in Lorentz transformation there is no forces; the so-called Minkowski Force, has no "physical reality", is only a mathematical expression, since velocities are constant and the masses, introduced "ad hoc", allow to obtain directly the values of Momentum and Energy, with very special characteristics, completely different from the same magnitudes of Classical Mechanics, as we have seen earlier.

Moreover, we have discussed that the introduction of "accelerated" systems, pretending to becomes trascendent as "absolute" entities, thanks to gravitation, fails, since the relationship between the forces involved are mere "definitions" or "identities" and **not equations** themselves, neccessary to establish any physical law. In this sense, we could check that the same is true with the tensor mathematical language, despite the feeling of "absolute" truth that produces the knowledge of the rules involved.

For this purpose, the variability of the metric, $g_{\mu\nu}$, suggests to perform the Covariant differentiation, of any vector, A^λ: $DA^\lambda = dA^\lambda + \Gamma^\lambda_{\mu\nu}A^\mu dx^\nu$ (13), where $\Gamma^\lambda_{\mu\nu}$ are the coefficient called "Christoffel symbols" or "affin conections", related to the four-dimensional curvature.

If we identify that vector with four-momentum, ie, $A^\lambda \equiv p^\lambda$ and we do the derivative respect the proper time, $d\tau$, the Covariant Derivative: $F^\lambda = \frac{Dp^\lambda}{d\tau} = \frac{dp^\lambda}{d\tau} + \Gamma^\lambda_{\mu\nu}\, p^\mu v^\nu$, where F^λ is the total force, which must be zero, $F^\lambda = 0$, as described above and the equation becomes $dp^\lambda/d\tau + \Gamma^\lambda_{\mu\nu}p^\mu v^\nu = 0$, which can be transformed as it follows:

$mdv^\lambda/d\tau + m\Gamma^\lambda_{\mu\nu}v^\mu v^\nu$ ===> $d^2x^\lambda/d\tau^2 + \Gamma^\lambda_{\mu\nu}\left(\frac{dx^\mu}{d\tau}\right)\left(\frac{dx^\nu}{d\tau}\right) = 0$ (14), which represents the **Geodesic equation**.

On the other hand, from the covariant derivative we may take out the force, $f^{\lambda} = \frac{dp^{\lambda}}{d\tau}$, so we have $f^{\lambda} = -\Gamma^{\lambda}_{\mu\nu} m v^{\mu} v^{\nu}$ ===> $f^{\lambda}/m = -\Gamma^{\lambda}_{\mu\nu} v^{\mu} v^{\nu}$ (15).

But that strength comes from a four-dimensional momentum, *p*, from which, p^{o} and p^{i} correspond to different physical magnitudes, energy, E, and momentum, ***p,*** and their relationship according quadratic condition in the Special Theory turns out to be an "identity" and **not** an **equation**; therefore, the only way of admitting that force is considering $d\tau = dt$ and $f^{\lambda} = f^{r}$, in which case it may be identified with a gravitational newtonian force eith the mass, *m*, constant.

In this case, the most appropriate application of the expression (15) is by using curvilinear coordinates (r, θ, φ) instead of (*x*,*y*,*z*), so that $\frac{f^{r}}{m} = -\Gamma^{r}_{\theta\varphi} v^{\theta} v^{\varphi}$, where the first term represents the intensity of the gravitational field, ie, $f^{r}/m = g$, while $-\Gamma^{r}_{\theta\varphi} v^{\theta} v^{\varphi}$ ==> $-\Gamma^{r}_{\theta\theta} v^{\theta} v^{\theta} = -v^{2}/r = -a_{C}$ (16) corresponds to centrifugal acceleration, which can be transformed in centripetal, $+a_{C}$, according to what have been said above; it is easy to see that Christoffel symbol coincides with the simplest expression of "curvature", $\Gamma^{r}_{\theta\theta} = 1/r$.

Thus, the only "curve spacetime" describing the **Geodesic,** corresponds to a **curve linear path**, which is what really macroscopic bodies will follow under **gravitational interaction.**

The velocity, *v*, is tangent to the "linear curve", so that if it would disappear the gravitational force, producing the centripetal force, the bodies should continue in this tangential direction as demand **inertia,** which contrary to what stated in relativistic theory is a characteristic property of "true matter", ie, the **actual mass**. This must have enough compactness to becomes a tangible object, which is achieve by strong, weak and electromagnetic "interactions", guided by Gauge Symmetry and whose intensities are much higher than the gravitational.

As we saw earlier, this Symmetry also required a Covariant Derivative, but acting in the "phase inner space", where relativist four-momentum is intyegrated, in accordance with Quantum Field Theory, while the related just above is doing it in the "exterior space" and as we just have seen, it does not added something new to the gravitational phenomena of newtonian theory, as this fully aware of the movements associated with our Planetary System and can be extended to all other planetary systems of any galaxie's star.

The four interactions are active in **stars**, whose formation requires the existence of all of them; the hydrogen atoms serve as a starting point when they are in a high energy situation, in which case they may be reduced to *protons* that may be converted into *neutrons*, through beta decay (*positrons)*, as we have said earlier. These *neutrons* can join each other and with other *protons*, thanks to **weak** and **electromagnetic** interactions, with the consent of the **strong** one, resulting helium nuclei; the production of heavier nuclei, depends on the size of the star involved.

In short, it is the **fusion nuclear reaction**, also called thermonuclear, for obtaining the **true matter,** which, actually, it constitutes the "source" and "object" of **gravitational interaction**.

C) **Dark matter:**

We have to mention that the application of the Covariant Derivative of any tensor allows obtaining the so-called Tensor de Rienmann, $R^{\lambda}_{\mu\nu\sigma}$, which represents the space-time "curvature" in its final form, as Christoffel symbol is not properly a tensor; Rienmann tensor permit simplifications or contractions that leads, first to the Ricci tensor, $R_{\mu\nu}$ and then to the Scalar, *R*, with which it is possible to synthesize or summarize the "total curvature" of spacetime, with what we may get Einsteins's equations:

$(R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R)_{;} = 0$ in the absence of matter; $R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = T_{\mu\nu}$, where $T_{\mu\nu}$ is the energy-momentum or four-momentum tensor, which shall have the same condictions as Riemann tensor and its covariante derivative must be null, $(T_{\mu\nu})_{;} = 0$.

Is it not superfluous or redundant the inclusion of the latter tensor although, actually, these equations are simply the result of definitions or mathematical identities carried out in the formalism of tensor or manifolds within the general transformation of the metric, $g_{\mu\nu}$

This is intended to account for the physical evolution of the Universe, after establishing: **spacetime curvature** becomes "**cause**" and "**effect**" of gravitational field "Philosophy" or "Experimental Science"?

The consequences of these equations are well know and come to set the Cosmological Model of an "Expanding Universe"; but, as a result of a comprenhesive review on Doppler Effect, Schawarzchild and Robertson-Walter metrics, etc, it has allowed us to consider the best option of Steady-State Universe in our article: "**Cosmological Model**: **A New Approach**" (International Journal of Scientific & Technology Reasearch. Volume 4, Issue 08. August 2015).

Finally, considering that the relativistic masses (electromagnetic and virtual) involved in the Special Theory, are also assumed by the General and virtually all that comes from galaxies or other objects, as well as the stars of our galaxy, consists of radiation, the matter we can assign it is "grey", but with a "dark" hue: **dark matter.**

2. CONCLUSION

We have been given enough reasons to support the concept of electromagnetic and virtual mass and, although apparently it seems that complicates the situation of Theoretical Physics, by invalidating "Unification" paradigm, mainly based in a single kind of mass (inertial), we must not forget the problems in the consolidation of the Standard Model of Particles and the Cosmological Model of the Universe.

This is because it is overvalued a theory based on the on the only plausible explanation for the enormous energy put into play in nuclear processes by oft-repeated formula of energy,

$E = mc^2$; but as we have seen, this is easier to understand by the concept of virtual than the actual or inertial mass, avoiding terms such as "materialization" of energy that refers to "spiritualism" of the last century and now it serves as a stimulus to the fashion of "science fiction".

We have emphasized that the obsession with defining the concepts of "absolute" and "relative", has led to change variables such as space and time, traditionaly considered as absolute, in relative, while velocities and accelerations, representative of physical laws, passed from relative to absolute: a kind of new "copernicanian revolution", with the aggravating circunstance that intuition, which is the most powerful tool of our mind, disappears.

Accordingly, we have an Universe in which space-time has become a fabric or tissue active, as a "cause" or "origin" of the evolution of objects, so they are forced to follow the lines spacetime geodesic demand. A whole physical geometric fantasy or a fantastic physical geometry!.

Finally, we must note that instead of the proposed **Unification,** will have the realization that the true paradigm imposed by Nature itself is **Dualism**, similar to the cartesian, "Mind" and "Body", which may be consistent with the Evolution Theory of Darwin, as we have tried to show in our previous article: "**The Adventure of Science**" (International Journal of Mathematics and Physical Sciences Reasearch. ISSN 2348-5736 (online). Vol. 3, issue, pp: (22-32). Month: October 2015- March 2016. Available at: www.researchpublish.com.

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