THE UNIFICATION THEORY IN PHYSICS

Francisco Martinez Flores.

Physicist, Chemical Engineer and Physics-Chemistry Teacher (retired).   August 2019.

C/ M. Font de Anta, 55 GINES (Sevilla). 41960. Spain. Telf. 954717473 – 638775430.

Abstract: **Standard and Cosmological Models bring about such a number of controversial questions, liable to confusions and embarrassments, which justifies the convenience of carrying out a review of the principles and development of Theoretical Physics, based in relativity, which is established around two fundamental constants, c and h, that constitute the "absolute" inherent in electromagnetic radiation, so any physical quantity linked to them, such as   mass and time, must be variables (not constant), that is, they are physical quantities "indeterminate", that can not be accepted by Classical Mechanics, but may be couple with Quantum Theory.**

General Theory of Relativity is established by mathematical tensor analysis applied to the kinematics Interval of the Special Theory, giving rise to the Einteins equation, which aims to integrate Gravitation, based on a space-time curvature; but when it is carried out on the dynamics Interval (four-momentum), it appears another curvature, so-called torsion, due to the fields (scalar and vector potentials), which produces a force of electromagnetic nature, equivalent to a stress-energy tensor that may give physical meaning to the Ricci tensor of Einstein equation.

This equation should be complementary to the gravitational one, which can not accept any potential vector, so the paradigm to which physical laws must conform is Duality and not Unification; with this dichotomy, that is, Classical Mechanics vs   Quantum Electrodynamics, it would be possible to overcome some epistemological problems   such as spacetime curvature, the failure of gravity   quantization, supersymmetry,   string theory, entanglement, renormalization, dark matter, dark energy, etc.

Keywords: **absolute, relative frames, electromagnetic mass, curvilinear space-time, torsión.**

1. INTRODUCTION

The big problem with Theoretical Physics is in the very name, which demands a greater complexity in the mathematical formalism, something contrary to any simplification that was manifested some centuries ago by the Occam's razor criterion; thus, in opposition to such caution, new mathematical relations are being introduced with doubtful o no physical meaning, leading to a crisis of method and metaphor in Modern Physics, as it has been happening with the mathematical artifice that realizes the coupling of Classical Mechanics with Electromagnetism, based on the Least Action's Principle.

Any shallow analysis on the method employed lends itself to inconsistencies that any critical mind should not let go; whithout getting into philosophical disquisitions on the nature of objects or things, it turns out weird the role that that Mathematics had taken on Physics, according to the ideal stated by Hilbert: "Physics must be mathematized a priori".

In this sense, an experimental science like Physics has been paradoxically adjusting to principles that are like mathematical axioms, from which the laws of Physics will appear deductively; this program has such appeal to the mind, that Relativity Theory, either the Special or General, has been accepted not only because they are true, but because the same axioms are presented as self-evident, even when experimental tests do not exist or are of poor reliability.

The development of Physics in the XIXth century showed that their progress was to elaborate theories that unify different physical phenomena, as it happened with Maxwell's laws on Electromagnetism.   In this line, Relativity is constructed in the following century, in order to   Unify Electromagnetism and Classical Mechanics, which arises around the concept of "absolute", adscribed to space and time since Newton and assumed by Kant, but objected by Leibniz, Mach and finally by Einstein, although without the caution demanded by two fundamental facts:

a)   Michelson's experience on the suppression of the éther in the propagation of electromagnetic waves in the vaccum, due to the "absolute" character of the velocity, c, which does not allow physical meaning for the quantity, c-v.

b)   The introduction of energy quanta by Planck, requires a different method that newtonian dynamics, for being a statistical law applied to a new kind of particles.

On the other hand, the Standard   Model have been established on the conjunction of the three types of forces: electromagnetic, strong and weak, but it cannot be considered a success, as it is evidenced by the need to introduce Supersymmetry, where the particle status becomes blurred, due to the conversion of one kind of particle (fermion) into another (boson).

Regarding the Cosmological Model, it is surprising the argument used in the evolution of stars, according to which it is possible to produce a "gravitational" collapse,   despite the extremely small value of the constant, G, respect of the others interactions (strong, weak and electromagnetic); besides, Gravitation resists being "quantized", so that trying to explain the evolution of such a huge Universe through the said model, leads itself to well-founded objections, as we shall try to point out with what follows.

2.   RELATIVITY AND GEOMETRY

Relativity is a theory based on the formulation of a four-dimensional space, where the rules of tensor algebra for rectilinear   or minkowskian geometry   and manifolds   for the curvilinear one,   becomes physical laws based on invariances or symmetries.

In this sense, such laws must be independent of the reference systems chosen, but measurement is the central axis upon which the certainty of a theory rests, so that if we do not take into account that condition, it would be easy to arrive at the wrong conclusions.

This is what we believe is happening with this theory, where although the setting-up is so well woven that the mathematical and physical concepts appears closed as a "loop", so the arguments becomes what it is called "tautology" in Philosophy and in Mathematics "identity".

In Special Relativity it is postulated that the moving system is <u>inercial,</u> because for the observer placed in it, the velocity, would be null, $v = 0$,   becoming an absolute, that serves as pivot beteween two relatives times, on account of the speed of light, c. It also happens with the General Theory, in relation to accelerated null frames ($a = 0$), which   is established as an "absolute" when it is introduced the acceleration of gravity, with which it is intended to be   the definitive referent that will account for the evolution of the Universe as a whole.

But, it seems to have overlooked that the true "absolute" is the <u>constancy </u>of the speed of light in vacuum, *c,* so that the physical magnitudes linked to that, such as the "proper" time and the mass "at rest" can not be constant, because in that case they should also be absolute.

Anyway, the problem lies in articulating experimental procedures to carry out the measurement of the physical quantities involved from different moving systems, considered equivalent, which should affect the interpretation given to these quantities and their relationship.

3.   SPECIAL RELATIVITY

It has been established that any physical law must be based in the concept of "relative times", according to which "synchronized" clocks may be placed at different moving systems.

How to admit the any physical phenomenon or event can be subject to different times?.

Those are included in the so-called   <u>time</u> <u>dilation:</u> $dt = dt'/\sqrt{(1-v^2/c^2)}$ (1), with which it is established the existence of two elapsed times: *dt',* is linked to the moving frame (O'), while *dt* will be to the fixed (O), so that the velocity, v, only affects *dt,* because to *dt'* corresponds $v = 0$, as it is deduced when applying the previous formula or its equivalent to, $c^2 dt'^2 = c^2 dt^2 - v^2 dt^2$, according to which *vdt* is perpendicular to the distance, *cdt',* traveled by light from the moving frame (O'), while the light emitted from the fixed frame (O) will travel the distance, *cdt,* to reach the same point.

But, there is <u>no</u> <u>experimental</u> evidence, since it is not possible to measure the times corresponding to the distances   *cdt* and cdt'; even more, we must bear in mind that the previous formula comes from the initial approach of the theory, according to which   fixed (O) and moving (O') frames are established with respect to coordinates (*x,t*) and (*x',t'*),

respectively, which are reduced to the elapsed times dt, dt', without realizing that the space coordinate, x', disappears, that is, the moving frame (O') disappears.

For this reason, the relationship between both times should be the same, whatever the speed, v, that is, $dt/dt' = 1/\sqrt{(1-v^2/c^2)}$ must be fulfilled for any value of v, so that for a higher value of it, there will be an increase of both elapse times, dt and dt', which introduces a variability in both quantities: it turns out a mathematical **identity**.

To overcome this situation it is introduced the condition of Interval, $ds = cdt' = cd\tau$ = const, by which we may have the "equation": $c^2dt^2 - v^2dt^2$ = const (2); but, this only works for a fixed value of velocity, v, which it corresponds to the "boost" of Lorentz's Group, and then the value of dt will also be constant, that is, it turns out a mere geometrical relationship.

In short, cdt, substitute or replaces to $cdt'/\sqrt{(1-v^2/c^2)}$, which it is in consonance with the "redundancy" of the observator in the moving frame (O'), so the only certainty is that $cdt > cdt'$ and also that the formula, $dt' = dt\sqrt{(1-v^2/c^2)}$, may only be understood when both elapsed times, dt and dt' are variables.

This interpretation is not against with the established tensor algebra, where the contravariant and convariant vectors: $dx^\mu = (cdt + vdt)$ and $dx_\mu = (cdt - vdt)$, respectively, allows to get the Interval: $ds^2 = dx_\mu dx^\mu = (cdt + vdt)(cdt - vdt)$ $= c^2dt^2 - v^2dt^2$ = const., since $ds = cdt' \equiv cd\tau$ (constant)

It turns out a simple mathematical display, where cdt' represents just a distance, which is considered constant just by "convention", since when changing the velocity, v, the quantities cdt, vdt and cdt' also vary, that is, all the parameters (v, dt and dt') are variables; this is the meaning of the **identity**, whose formula only indicates the relationship between physical magnitudes, but no calculation can be made, because if dt' were constant will be another absolute, like, c, that can not be measured (detected), which is in consonance with the "redundancy" of the observer at the moving frame.

This important conclusion may be explained, admitting that the elapsed time, dt', really has meaning if cdt' is a distance associated with "vacuum", from which can be produced, cdt, thanks to the velocity, v; with other words, the absolute value of c, as the speed of light in "vacuum", allows to estimate that the quantities cdt, vdt are relatives to cdt', but the latter must also be variable. otherwise, it would be absolute as c.

The name of "proper" time a $dt'(d\tau)$ and the consideration of "absoluto" to $v = 0$, are just trick to emphasize the relevance of that physical quantity.

-The "twin paradox", as well as the "time machine" are only science fiction topics!.

In summary, the relationship between dt and dt' is the same that the correspoding to the distances traveled by light, cdt and cdt', but the elapsed times can not be measured, so that any relativistic event should be adjusted to the parameters that define the propagation of electromagnetic waves; in this sense, the relation of "times" maybe be transferred to that of "frequencies", through the corresponding period, T: $w = 2\pi/T = 2\pi/dt$; $w' = 2\pi/dt'$, so the formula (1) will become: $w = w'\sqrt{(1-v^2/c^2)}$, from which it will be able to explain the Doppler Effect, after considering that the direction of the propagation of the electromagnetic wave, according to cdt, is perpendicular to the one corresponding to the electric field, which coincides with that indicated in vdt', as we shall see below.

3.1. Energy and Momentum: Relativistic mass

It is accepted that any particle, either elementary (electron) or not (proton, neutron,..), whose speed approaches that of the propagation of electromagnetic waves, c, its mass, m, must go to infinity, while for a very small velocity that mass approaches the so-called "proper" or at "rest" mass, m_o, which is considered constant and established as energy, by virtue of the velocity, c,

according to the expression, $E = m_oc^2$, although its explanation comes to be summarized by affirmations such as "matter is merely potential energy" or "mass is equivalent to energy".

Such statements lead themselves to the following questions:

a) *Would it not be incongruous for a real or inertial mass, m_o, of any particle being assigned a velocity, c, that cannot assume?.*

b) *What kind of potential energy*? and ¿*What is the meaning of that "equivalence" in an experimental science?*.

To begin with, it seems that such questions might be clarified by the introduction of <u>relativistic</u> <u>mass</u>, $m = m_o/\sqrt{(1-v^2/c^2)}$ (3), which according to the usual interpretation may be applied both electron or any other particle as well as to radiation, whereas, m_o, would only be valid for the particle; but this can be avoided, demonstrating that the only mass to consider should be the relativistic one, m, in the same way as we have said respect the time, dt, by virtue of the similarity between the expressions (1) and (3).

In this sense, we will have the equations of Energy , $E = mc^2 = m_o c^2/\sqrt{(1-v^2/c^2)}$ (4) and Momentum, $\mathbf{p} = m\mathbf{v} = m_o\mathbf{v}/\sqrt{(1-v^2/c^2)}$ (5), although at the latter it is noteworthy that there is something strange, since $\mathbf{p}$ depends of v in a double way: directly and through the relativistic mass, m.

Following the method of classical mechanics, that is, to establish the relationship between the dynamic quantities, E and **p**, we arrive at the well-known <u>energy equation</u>**:**

$$E^2 - c^2\mathbf{p}^2 = (m_o c^2)^2 \quad (6).$$

But, this expression or its equivalent: $E = \sqrt{[(c^2\mathbf{p}^2 + (m_o c^2)^2]}$, are really mathematical **identities**, as it is very easy to verify: on taking (4) and (5) and putting it in (6), we find that the quantity $(m_o c^2)^2$ is obtained as a result of an algebraic calculation, where both quantities, E^2 and $(c\mathbf{p})^2$, disappear.

Therefore, the relationship between these quantities should <u>not</u> be accepted as an <u>equation</u>, since the formula (6) only indicates the relationship among the quantities, E, p and m_o, being all of them variables, so we can not perform any calculation; with other word, if m_o = const, it would be an absolute, which is impossible for the only absolutes in Modern Physics are c and h.

Actually, this <u>identity</u> is evidenced by the definition of relativistic mass itself, so that instead of (3) it should be: $m \equiv m_o/\sqrt{(1-v^2/c^2)}$, in which case, m substitute or replace to m_o, on account of the dilation factor, $1/\sqrt{(1-v^2/c^2)}$, so that the ratio between m and m_o (m/m_o), must be the same "whatever" the velocity, v, just like what happened with the times, dt and dt', that is,

we find again with the "identity", represented by the formula (6):

$$m \equiv m_o/\sqrt{(1-v^2/c^2)} \Longrightarrow mc^2 \equiv m_o c^2/\sqrt{(1-v^2/c^2)} \Longrightarrow (mc^2)^2 - c^2(m\mathbf{v})^2 \equiv (m_o c^2)^2 \Longrightarrow$$
$$E^2 - c^2\mathbf{p}^2 \equiv (m_o c^2)^2.$$

This result is consistent with the tensor mathematical approach, through the <u>Four-momentum</u>, p, after defining the vector contravariant, $p^\mu = (E, +c\mathbf{p})$ and covariant, $p_\mu = (E, -c\mathbf{p})$:

$p^2 = p^\mu p_\mu = (E +c\mathbf{p})(E -c\mathbf{p}) = E^2 - c^2\mathbf{p}^2 = $ const (7), where the constant $(m_o c^2)$ allows the relationship (6) to be an equation, which is justified as a conservation law or "symmetry", according to which:

$E_2{}^2 - c^2\mathbf{p_2}{}^2 = E_1{}^2 - c^2\mathbf{p_1}{}^2 \Longrightarrow (m_2 c^2)^2 - c^2(m_2\, \mathbf{v_2})^2 = (m_1 c^2)^2 - c^2(m_1\mathbf{v_1})^2.$

But, it turns out a "fake" <u>equation</u>, because if $v_2 > v_1 \Longrightarrow m_2 > m_1$ and the variation of energy, is greater than that of momentum: $(m_2{}^2 - m_1{}^2)c^4 > c^2(m_2{}^2 v_2{}^2 - m_1{}^2 v_1{}^2) \Longrightarrow$

$(m_2 c^2)^2 - c^2(m_2\mathbf{v_2})^2 > (m_1 c^2)^2 - c^2(m_1\mathbf{v_1})^2 \Longrightarrow E_2{}^2 - c^2 p_2{}^2 > E_1{}^2 - c^2\mathbf{p_1}{}^2$, where, $m_o c^2$ is variable (not constant), which is a clear demonstration of the mathematical "identity".

Therefore, the measured mass of the electron must be the relativistic, $m = 0.51$ MeV, which whopyuld not be considered as a minimun quantity, but as an eventual value with respect to the mass of the proton.

In this way, the variability of <u>Four-momentum</u>, $p^2 = (mc^2) - c^2(m\mathbf{v})^2$, may fits perfectly in the Minkowski Diagram, especially in the null Interval, where the total "indeterminacy" of the mass, m, explains the equality $E = cp$:

a) Time-like Interval, $p^2 > 0$

b) Space-like Interval, $p^2 < 0$

c) Light-like Interval, $p^2 = 0 \implies (mc^2)^2 - c^2m^2v^2 = m^2(c^2-v^2) = 0 \implies v = c$, so the mass may have any value, ("indeterminate"), which another prrof that is an identity (not equation) and in that case, it will be avoided the infinite implied in the formula (4).

The consequences are obvious:

- There is <u>no</u> <u>mass</u> at "rest", since the condition of $v = 0$, would imply the disappearing of m and then m_o does not make sense; actually, a mass at "rest" and constant has no physical meaning in Special Relativity and therefore can **not** be **inertial.**

- The so-called Minkowski force obtained through dp/dt can only be considered from the electromagnetic point of view, as we shall see below.

3.2. Photoelectric Effect

It is been considered the inertial nature of the mass, m_o, on account of the crucial role given to the kinetic energy: $E_c = mc^2 - m_oc^2$, which is obtained through the serie expansion of the energy, $E = mc^2 = m_oc^2/\sqrt{(1-v^2/c^2)}$, when $v \ll c$: $mc^2 \approx m_oc^2 + 1/2m_ov^2$; but this kinetic energy is only a mathematical formula, whose physical meaning is inconsistent with the mass contained in, m_oc^2, where c is acting as a true velocity that no inertial mass may assume.

However, this kinetic energy is interpreted as the cause or origin of the energy, $E = mc^2$ and then the Principle of Equivalence is established, between mc^2 and $1/2m_ov^2$, so that if m_o is <u>inertial</u> it should also be m; this seems to be in line with the Einstein's article:

Does the inertia of a body depend upon its energy-content?".

From which it is noteworthy: $E - E_o = (E_o/c^2)v^2/2 = 1/2m_ov^2$, where it is "inferred" that the radiation represented by E_o has inertia as "energy-content"; but this is questionable, since $m_o = E_o/c^2$ and $1/2m_ov^2$ must be fulfilled simultaneously, that is, the inconsistence remains and the kinetic energy, $E_c = 1/2m_ov^2$, is just a formula as a result of an approximation, whose physical meaning is in contradiction with $E_o = m_oc^2$.

Actually, Einstein used it to explain the **Photoelectric Effect**, after converting the previous equation in: $h\nu - W = 1/2m_ov^2$, where $h\nu$ is the energy of the quantum of action corresponding to the radiation incident on a material (metal), while W is the binding energy of the electrons in the metal.

Then, $1/2m_ov_{max}^2 \equiv eV$, where the maximum velocity, v, corresponds to a minimum (ground state), $W = const$, so, the previous equation becomes: $h\nu - W = eV ====>$

$V = h\nu/e – const$, where the relationship between the potential, V, and the frequency, ν, conforms to the experimental data, which is used to establish the inertial nature of the mass, m_o, for being included in the kinetic energy

However, the identification of the kinetic energy with the electromagnetic magnitudes, eV, is in contradiction with the relativistic interpretation on $E = mc^2$; also, it is worth noting that the introduction of $h\nu$ requires a quantum approach, according to which it should be fulfilled: $h\nu = E – E_o = mc^2 – m_oc^2 ==> h\nu + m_oc^2 = mc^2$, where the energy of radiation (photons) acts on the bound electrons, $m_oc^2 \equiv W$, producing electrons with energy, $E = mc^2$; then, we may apply the relationships: $mc^2 = eV$; $m_oc^2 = eV_o$, by which we can get the equation of the <u>Photoelectric Effect</u>: $eV = h\nu + eV_o ==> V - V_o = h\nu/e$ (8).

It turns out a "true" physical equation, for the diference of potential, $V-V_o$, is produced on account of the radiation energy, $h\nu$, being the relativistic mass, m, the adequated physical quantity, while the kinetic energy, $1/2m_ov^2$, does not appear, that is, is irrelevant.

3.3. Electromagnetic mass

Taking into acount all the above, it seems evident that there is <u>no</u> deterministic evolution for any particle in Relativity, since the Energy, $E = mc^2$ is not obtained from momentum, $p = mv$, but both physical quantities are depending of the relativistic mass, m, variable, which is produced from an unknown value, m_o, that is, E and p are "indeterminates".

If in addition the mass "at rest" is not possible, that kind of <u>mass</u> can **not** be **inertial** and then it should not be accepted by Classical Mechanics, so that the only way to consider it is as **electromagnetic** and **virtual,** which may be assumed by Quantum Theory, where a real or "inertial" mass does not fit properly.

The usual given explanation that c is just a simple constant is not adequated, since from a dimensional point of view behaves as a velocity to give "reality" to the energy, mc^2, while $m_o c^2$ would be like an empty energy, associated with "vacuum" (as we have seen with cdt'), from which may be extracted the particles with energy, mc^2, similar to what happens in Quantum Field Theory for bosons and fermions.

The relationship between dynamic variables, energy, E, and momentum, **p,** given in a determinist way, is only possible by the constancy of m_o, so when introducing them in the Hamiltonian and Lagrangian functions of Classical Mechanics, we shall have again "identities" disguised as equations, which may be the origin of the Supersymmetry in the Standard Model.

Finally, the so-called **Unification** between Classical Mechanics and Electromagnetism **"fails"**, but the effort made with Special Relativity has its compensation in Quantum Field Theory, where the indefinite (indeterminate) values of energy and momentum correspond to the Uncertainty Principle, as it will be discussed below.

4. RELATIVITY AND QUANTUM THEORY

The success of Relativity Theory lies in the explanation of higher energies coming into play in the subatomic particles and its impact in Nuclear Physics, due to $E = mc^2$, where the relativistic mass, m, as a responsible of such energies, is indeterminate.

On the other hand, taking into account the the time interval, dt, variable, is related to the frequency, w, of the electromagnetic wave, which in turn is making it with the Energy through the Planck equation, $E = \hbar w$, we find that the quantities m and dt are inversely related and should be considered from a statistical point of view.

In the same way the momentum, $p = mv$, behaves, when relating to the wave number, k, according to the law of De Broglie): $p = \hbar k$ (16), that expresses the particle-wave duality, with which both energy and momentum acquire true meaning when they are in consonance with the phase of the electromagnetic wave, $(wt-kx)$, where $w/k = c$.

Then Relativity can be accepted by Quantum Theory, thanks to the Uncertainty Principle: $\Delta t . \Delta E \geq \hbar$; $\Delta x . \Delta p \geq \hbar$, which may be expressed: $dt . \Delta E \geq \hbar$; $dx . \Delta p \geq \hbar$ (17), so, the relativistic relations between energy and momentum must be adjusted to:

$dt \geq \hbar/\Delta E$, ==> $1/dt \simeq \Delta w$; $dx \geq \hbar/\Delta p$ ===> $dx \simeq 1/\Delta k$, with what finally:

$dx.(1/dt) \simeq \Delta w/\Delta k = v$, that is, is the velocity of the wave group, which is lower than the phase wave: $v < c$.

This velocity can be adscribed to particles such as electrons, but not to photons, which requires a frequency, w, according to Planck's law.

Eventually, the energy, $E = mc^2$, is usually expressed in electron-Volt (eV) units, under

$eV = mc^2$, what is consistent with the assertion about the nature of the mass, so it turns out reasonable to establish a radical difference between the real or inertial mass, adjusted to the laws of Classical Mechanis and Chemistry and the electromagnetic and virtual, applicable to Relativity and therefore to Quantum Theory.

This corresponds to the existence of two spaces, in consonance with the "Duality":

1) Abstract or "inner", similar to the phases of the wave functions (fields), where the quantum particles must have a relativistic mass (variable). This space is induced by **charges,** e, in which case it will have full meaning the expression, $e\Delta V = \Delta mc^2 = \hbar\Delta k v$ (18), where the mass, Δm, can be considered, on the one hand derived from the charge, e, (as a particle) and on the other be attached to the wave (k) , so we have another demonstration of the **electromagnetic** and **virtual** nature of the mass corresponding to elementary particles (leptons), like the electron, whose experimental determination (J.J.Thomson) requieres prior knoledge of its charge.

2) Ordinary or "exterior", in which the constant mass, m, is real or inertial, as we will see below.

4.1. Inertial mass vs Electromagnetic mass

The particles with inertial mass are composites or *hadrons*, which provide the necessary "structure" for the inertia may acts; this structure is achieved first by **Strong Interaction**, giving rise to the most stable *hadron*, the *proton*, whose charge (+1) is supplied by the sum of that corresponding to the *quarks, u(+2/3), u(+2/3), d(-1/3),* united through the interactive network of *gluons* and the property called "confinement", which does not allow them to go out.

The fact that the mass of *proton* (938.2 MeV) is much higher than that of estimated for *quarks* is in line with the existence of a kind of mass different from that of the elementary particles, due to the force produced by the interactive network giving rise to inertia**.**

Moreover, if it is added the *proton* may be considered in a dual form: a) in a quantum way, under its charge; b) classically, due to its inertia, we may have clarified the conceptual "confusion" respect to mass and energy and possibly the "mystery" of dark mass in the Universe.

But the "material" building is not completed until the appearance of the *neutron, (u, d, d)*, whose bigger mass (939.5 MeV) respect *proton* can be explained by the difference of "virtual" mass between quarks *d* and *u*. Although the *neutron* is an unstable particle, its decaying always leads to *proton,* so that both, as *baryons* or *nucleons,* shall have the same mass (inertial), when they are forming the atomic nuclei.

All the other *hadrons* have a very short life, as it can be seen with the average disintegration periods of the order of 10^{-10} s, so that to associate inertial mass to these particles, that is, to consider them as something tangible and coherent turns out irrelevant.

The union of *baryons or nucleons* is achieved thanks to **Weak Interaction**, which is produced by an exchanging of *bosons,* that is*,* the so-called Gauge Particles, *(W ,W⁺,Z),* whose high energies (80-90 GeV) correspond to masses of electromagnetic and virtual nature; it is considered that these particles act during a time, $dt \sim 10^{-16}$ s for being inertials, but that is not true, because this elapsed time is due to the enormous energy of the gauge particles, according to the Uncertainty Principle.

Further, ¿*how to admit that particles that act as bosons, through an unlimited exchange, may have inertial mass?.*

This question is in line with the Gauge Symmetry, which in fact implies the conservation of charges (coupling constants), from which are derived the masses, according to (18), and after getting the corresponding potential from the phenomenological Equation of Fermi, we may get the energies of the gauge particles, so that the explanation given by Higgs Mechanism, an elaborated model trying to consider the masses extracted from vacuum may be admitted, but with electromagnetic and virtual nature.

Indeed, from the Lagrangian density:

$\mathcal{L} = \frac{1}{2} D^\mu \phi^* D_\mu \phi + \frac{1}{2} m_o^2 (\phi^* \phi) - \frac{\lambda}{4}(\phi^* \phi)$ (19), we only have to work with the first term without having to resort to the others

In this sense, the Covariant derivative, D_μ, imply a curvature similar to that of Christoffel symbols, which acts in the "inner" space of the phases of complex scalar field, ϕ, ϕ^*, which are originated from the global and abelian Symmetry Group, $U(1) = e^{i\alpha}$, corresponding to electromagnetic field; that, when it is applied to the scalar field, ϕ, introduces the scalar Potential, A_μ, so that the derivative, ∂_μ, becomes $D_\mu = \partial_\mu + ieA_\mu$, where appears explicitly the **Electromagnetic Interaction,** eA_μ.

On the other hand, through the SU(2) Group as a generalization of U(1), we may have the "local" (non-Abelian) transformation, $\exp(i\alpha(x)^a A_\mu^a)$, so the absolute derivative will be $D_\mu = \partial_\mu + ig\alpha(x)^a A_\mu^a$, which contain the "weak charge" $g\alpha(x)^a$ and the "gauge potentials", A_μ^a, that must conform to Lie Algebra as Group's generators: $[A_\mu^a, A_\mu^b] = i\epsilon_{abc} A_\mu^c$ (20).

Then, the SU(2)xU(1) Group is formed, with the purpose of establishing a new "rotation" between the potential A_μ^c of SU(2) and the A_μ of the U(1):

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

If we consider as an empirical value, $sin\theta_W \approx 0.222$, we can get the coupling constant, *g, g',* since those are related with electron charge, *e:*

$g = g'tan\theta_W ; \quad g = e/sin\theta_W; \quad g' = e/cos\theta_W$ (21).

Finally, it is possible to obtain the energies involved in **Weak Interaction** by the Fermi Equation: E = $(G_F/\sqrt{2})JxJ'$ (22), where $G_F = 1.02x10^{-5}/m^2_{proton} = 1.66x10^{-5}$ GeV and *J, J'* are the currents associated with the coupling constants

or "weak charges", *g, g',* so the energies corresponding to gauge particles, W⁻, W⁺, will be: $E^2 = \sqrt{2}g^2/G_F ==> E = 37.3g \approx 80$ GeV, whereas in relation to Z, we have to use the two constants, *g* and *g',* according to

$$E^2 = (\sqrt{2})gg'/G_F ==> E = 37.3/cos\theta_W \approx 90 \text{ GeV}.$$

As we have seen, the energies attributed to gauge particles are not quantities that has to be justified by any Potential Energy included in the Lagrangian, since these can be derived from coupling constants or "weak" charges and as such through the relativistic mass, *m,* of electromagnetic nature and virtual, acting in the "inner" space; under this condition, may be accepted the mass of the Higgs boson by the vacuum breaking symmetry.

The "real" high energies are necessary to give consistency to atomic nuclei, where it is established the atomic mass unit (amu) corresponding to the real or **inertial** mass of atoms, molecules and macroscopic substances after applying the Avogadro's Number, whose manifestation takes place in the ordinary or "exterior" space, according to the laws of Chemistry and Classical Mechanics.

The acceptance of the atomic mass unit (uma), instead of the electron-volt (*eV*) in all the processes of Nuclear Physics has contributed to the existing confusión about the nature of the mass, which the so-called "principles of equivalence" does not clarify; as an example, we might consider the case of the mass difference between neutron(*u,d,d*) and proton (*u,u,d*), which is due to the corresponding among the quarks *d* and *u,* whose essential parameter is their charge, from which the mass is derived, that is, electromagnetic and virtual, like electrons.

In this line, the excess of *neutrons* over *protons* in many nuclei (isotopes) may produce "instability", leading to Beta disintegration:

$n ---> p + e^- (\beta^-) + \nu^*(antineutrino) <==> n + \nu (neutrino) ---> p + e^- (electron).$
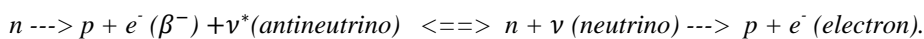
The *neutrino* is a particle withouth charge and massless, introduced by Pauli and supported by Fermi, to account for the conservation of energy and Parity's violation; but, as we have demonstrated above the quantity that represent the mass of electron, 0.51 MeV, is just eventual and is not a constant (minimum) value.

The equivalence between the two reactions is based on: a) time reversion (Feynmann); b) the consideration of "inner" space together with the concept of electromagnetic and virtual mass; c) an experimental evidence of low credibility; so, these particles may be associated with *isospin,* whose existence just occurs in the "inner" space, unable to get out to "exterior" space, in accordance with the article: *"Neutrino: A True Particle?"* (International Journal of Scientific &Technology Research. Volume 5, Issue 12, December 2016).

5. GENERAL RELATIVITY

5.1. Gravitational Equation

As it is widely accepted, the generalization of the special theory is done by establishing null acelerated frames, where the observer located there will experience zero acceleration, $a = 0$, that is, a similar situation to that of the moving one, v = 0; those values are considered as "absolute", although in reality replaces the absolute quantity, $d\tau$, because of the constancy of the Interval, $cd\tau$.

In this sense, to get a frame with a zero instantaneous acceleration, a = 0, it is introduced the Centrifugal force, $F_c = ma_c$, to cancel out the gravitational force, mg, so that we will have a zero force (aceleration): F = ma = mg + ma_c = 0 ===> $g + a_c = a = 0$, so, the "fictitious" centrifugal becomes a real one, following the interpretation given by E. Mach on the influence of stars and galaxies on the widening of the Earth in rotation.

In order to identify the gravitational mass, m, with the one used in special theory, *m,* another Principle is established: "equivalence between gravitational and the inertial mass"; it turns out "false" or rather unnecesary, because we are again with the "trick" of dispensing with the mass as the cause or origin of graviational interaction, as it has been done in relation to the Fotoelectric Effect.

Actually, we are in the same situation as in the special theory, where the "identities" are converted into "equations" and therefore into physical laws, so the argument used against

$v = 0$, will also be valid for $a = 0$, for the "weightlessness" it is only possible in the free-falling elevator, where for *a* = 0 ==> *g = 0,* as it shall be shown below.

Let us see how we may demostrate the previous argument, with which it is deduced when applying the general tensorial formalism (manifols) to the Interval, $ds^2 = dx_\mu dx^\mu$, which defines the "rectilinear" space-time, corresponding to Lorentz Group, turn into the "curvilinear" one, according to: $ds^2 = g_{\mu\nu} dx^\mu dx^\nu$ (23), where $g_{\mu\nu}$ is the so-called metric.

Its variability is realized by the Differentiation, D, so-called "covariant", for being applied to any contravariant vector, A^λ: $DA^\lambda = dA^\lambda + \Gamma_{\mu\nu}^\lambda A^\mu dx^\nu$ (24), where $\Gamma_{\mu\nu}^\lambda$ are the Christoffel symbols or affine connection, which are obtained by the derivatives of $g_{\mu\nu} \equiv e_\mu e_\nu$, defined by the covariant unit vector, and the concourse of the contravariant vectors inserted in $g^{\mu\nu} \equiv e^\mu e^\nu$, are producing a four-dimensional curved "space-time"; this is justified under the so-called "parallel displacement", according to which the four componentes of the vector, A^λ, are extracted from a rectilínear space of larger dimensions: *it is nothing more than a mathematical device, with which the only thing that proves is that ordinary space may be reduced to one of two dimensions!.*

Indeed, when the contravariant vector is identified with the velocity, $A^\lambda = v^\lambda$, the derivative with respect to the time, $d\tau$, will be the acceleration of the moving frame, that is, the corresponding to the accelerated frame, whose nullity defines the so-called geodesic or "world line":

$$Dv^\lambda/d\tau = a^\lambda = \frac{dv^\lambda}{d\tau} + \Gamma_{\mu\nu}^\lambda v^\mu \left(\frac{dx^\nu}{d\tau}\right) = 0 \quad ===> \quad d^2x^\lambda/d\tau^2 + \Gamma_{\mu\nu}^\lambda \left(\frac{dx^\mu}{d\tau}\right)\left(\frac{dx^\nu}{d\tau}\right) = 0 \quad (25)$$

But, it is a "fake" equation, since the elapsed time, $d\tau$, can only be linked to c, being then replaced by dt, as a scalar parameter according to the formula (identity) of time dilation, which implies that the accelerated frame is "redundant", just as it happens in the special theory with respect to the moving frame; thus, Dv^λ/dt, would have no physical meaning and the previous equation may be considered as: $dv^\lambda/dt + \Gamma_{\mu\nu}^\lambda v^\mu dx^\nu/dt = 0$.

Actually, the Christoffel Symbol (connections) appear by the derivation of the metric tensor, $g_{\mu\nu}$, when this is made with respect to the covariant vector, A_μ: $dA_\lambda = \Gamma_{\lambda\nu}^\mu A_\mu dx^\nu$ (26), which is equivalent to previous equation when the covariant vector is identified with the velocity, that is, $A_\mu \equiv v_\mu$, so the derivation of D of the velocity vector (v^μ or v_μ) with respect to time, dt, is always zero.

Anyway, from a physical point of view it turns out more adequated when $A_\lambda = v_\lambda$ through which we may get the "true" geodesic equation:

$$\frac{dv_\lambda}{dt} = \Gamma_{\lambda\nu}^\mu v_\mu v^\nu \quad (27).$$

In this sense, we have to introduce the space curvilinear coordinates, that is, the spherical ones, (r, θ, φ):

$\frac{dv_r}{dt} = \Gamma_{r\varphi}^\theta v_\theta v^\varphi \quad ===> \quad dv_r/dt = g_r$ and $\Gamma_{r\varphi}^\theta v_\theta v^\varphi ==> \Gamma_{\theta\theta}^r v^\theta v^\theta = v^2/r$, where Christtofel symbol, $\Gamma_{\theta\theta}^r = 1/r$, represents the **curvature**, that is to say, the closed curve line (circumference or ellipse) that follows any body subjected to gravitational interaction, with what we may have the newtonian equation: $g_r - v^2/r = 0 \quad ===> \quad g_r = v^2/r = a_c$, where a_c is the centripetal acceleration.

Now, it is easy to demonstrate que the acceleration of gravity can only have a zero value in the case of the "free" falling elevator, where it is experienced what we call "weightlessness", because all the quantities are null: $dv_r/dt + \Gamma_{r0}^o v_o v^r = dv_r/dt + 0 = 0 \quad ===> \quad g_r = 0$.

This is consistent with the fact that the observer in the moving (accerated) frame is redundant (unnecessary).

On the other hand, it is possible to obtain another important relationship, is we make use the equation (12), in relation to the spacial coordinates:

$dL_r = \Gamma_{r\nu}^\mu v_\mu dx^\nu$ (28), which corresponds to the angular momentum, if we include the mass, m: $L = r \wedge mv$ = const, whose constancy ensures that the trajectory is flat.

Finally, there is no reason to call "inertial" to the centrifugal force, since this is a property of the **real mass**, m, which is identified with that of the baryons (atomic nuclei), that is, the composed particles (hadrons), as we will show below; thus, the previous formula of the accelerations will become a true physical law: $mg_r = mv^2/r \quad ==> \quad F_{gravity} = mv^2/r$.

This equation is equivalent to the one corresponding to the energy balance:

$-GM$m$/r$ (potential energy) = $1/2$mv^2 (kinetic energy) ===> GMm$/r + 1/2$mv$^2 = 0$, from where we may consider that the scalar potential, $V = -GM/r$ is the only field associated with Gravitation, while the vector potential, **V,** only corresponds to electromagnetic field, that may be related to the relativistic momentum, $p = mv,$ where the mass, m, is electromagnetic (not inertial) and therefore different from m.

In this sense, the attempt to take up the light as any corporeal body subject to gravitational attraction is somewhat hardly to admit, since the experimental tests adduced by Eddington (1919) are of little reliability, as it was stated by M.Born (1962), in relation to the gravitational atraction of light by the Sun: "..*an exact agreement between theory and measurement has not yet been obtained".*

5.2. Einstein Equation

The Unification of gravitational and electromagnetic interactions seems available, if we take into account that the electrical potential, $V = const/r,$ from which the Electrostatic field,

$\mathbf{E} = \nabla V = const/r^2,$ turns out a similar relationship to the gravitational field.

In this sense, when we apply the differentiation, $DA^\lambda = dA^\lambda + \Gamma^\lambda_{\mu\nu}A^\mu dx^\nu,$ the second term, $\Gamma^\lambda_{\mu\nu}A^\mu dx^\nu,$ is interpreted as the variation of any physical quantity, represented by the contravariant vector, $A^\lambda,$ on account of the curvilinear nature of the "space-time"; but *there is no "curvature" space-time!*

The confusion comes from the chosen metric, $g_{\mu\nu}$, when trying to generalize the kinematic Interval, which very easily alludes to the Gravitation, but this interaction only occur when

$A^\lambda = v^\lambda$ ===> $DA^\lambda/dt = 0,$ so the time, dt, it is not included in the variables that produce the curvature.

For this reason, A^λ should be represent a different magnitude of the velocity and then the derivative may be carried out on any scalar parameter, like the elapsed time, dt: DA^λ/dt, which takes us to the Riemann curvature tensor, $R^\lambda_{\mu\nu\sigma}$, and finally after the simplification by the Ricci tensor, $R_{\mu\nu}$, to the **Einstein Equation**: $R_{\mu\nu} - 1/2g_{\mu\nu}R = 0$, (29), where the parameters (variables) involved are reduced to two, with which the intertwining is only established by the space coordinates.

This is in line what has been said above with respect to the equation (25), that is not fulfilled because $d\tau$, is not constant and then is inmediately replaced by dt, with the result that the previous equation can <u>not</u> assume the <u>gravitational</u> acceleration.

Actually, the true generalization of Relativity occurs when, instead of the Kinematic Interval, the Differentiacion (24) is applied to the Dynamic Interval, that is, to the Four-momentum:

$p^2 = g_{\mu\nu}p^\mu p^\nu,$ where the time is replaced by the energy, E, and the velocity by momentum, **p.**

But as we have seen above, although the relativistic approach pretends to conform to Classical Mechanics on account of $E = mc^2$ and $p = mv,$ the mass, m, is of electromagnetic nature, which allows the energy to be proportional to the scalar potential, $E = eV,$ and its variation may be produced by the radiation, $E = h\nu$, as we have seen with the Photoelectric Effect; likewise, $p,$ must be related to the potential vector, V: $p = eV$.

In this sense, the physical quantities may be represented by the covariant vector, $V^\lambda = (V, V)$, so the Diferentiation respect to the coordinates:

$dV^\lambda/dx^\mu = (dV/dx^\mu, dV^\lambda/dx^\mu) = (\nabla V, \nabla \wedge V) = (E, B)$

They are "true" physical equations, since the variation of both potentials, $V, V,$ may be produced by the electric and magnetic fields of the radiation (light), which act through the

so-called <u>Lorentz's</u> <u>force</u>: $F = e(E + B \wedge v);$ this expression is equivalente with that obtained by the derivative with respect the time of Four-momentum, p^λ:

$f^\lambda = Dp^\lambda/dt = dp^o/dt + \Gamma^\lambda_{\mu\nu}p^\mu dx^\nu/dt = eE/dt + e\Gamma^\lambda_{\mu\nu}B^\mu v^\nu = e(E + B \wedge v)$ (30).

The "curvature" of space-time has been replaced by that of the Electric and Magnetic fields, so that the first one, may produce a force in the direction of the velocity vector, *v,* while the corresponding to the magnetic field is perpendicular to that velocity.

Actually, this "force" or its equivalente expression of <u>stress-energy tensor,</u> $T^{\mu\nu}$, corresponds to the Ricci tensor of the Einstein equation, not as material source of the gravitational field, but as a physical quantity of **electromagnetic** nature, responsible for the curvature, so-called "torsion" in the ECE theory (Einstein-Cartan-Evans), which can explain the magnetization of matter by means of circularly polarized electromagnetic radiation, as well as the formation of permanent magnetic fields inside certain macroscopic bodies (magnets).

In this sense, it is noteworthy that while the directions of the gravitational force and the propagation of light (electromagnetic radiation) from the Sun are the same, the effects are different:

a) In the gravitational case, there is a translation movement around the Sun and the curvature corresponds to that of the flat closed curved line, consistent with the constancy of the angular momentum.

b) The interaction of the electromagnetic field of the radiation on the surface of the Planet (usually with some positive charge), produces a variation of geomagnetic field of the same*,* giving rise to the curvature that corresponds to the rotation of Planets and the inclination of its axis with respect the direction of the angular momentum of translation, due to the electric and magnetic field, respectively.

-The lower rotation time of the Earth, with respect to those of Mercury and Venus is due to the geomagnetic field of the Earth.

- The higher inclination corresponding to Mercury axis is due to a higher intensity of the electromagnetic field of the incidente light

The result is that Einstein Equation, in its assumption as an electromagnetic force (stress-energy tensor), may only account for the events that take place in the Universe, according to Quantum Eletrodynamics:

- The recent images in relation to the so-called "black hole" can only be admitted as radiation from an explosion or event ocurred 53 millions years ago, but *not as "clouds" of frozen photons because of gravitation!,* since the difference between the inertial and electromagnetic mass does not allow Gravitation to act on electromagnetic quantities; likewise, it is not possible to cancel the time interval, *dt,* while it remains, $d\tau$, as it is made in the Schwarzchild metric.

- The action exerted by the Electric ands Magnetics fields of the radiation on matter (inertial mass) leads to variations of the kinematic state ot the same, but the opposite effect is not possible, so the "gravitational" waves detected are really "electromagnetic" waves.

In short, General Relativity can explain the Universe, where Gravitation and Electromagnetism in its Quantum implication, act in a complementary way.

6. CONCLUSION

The great mistake that is dragging Theoretical Physics comes from the acceptance of the Einstein concepción of the inertial mass, as a "measure of its energy content", overlooking that c is not a mere constant, but it behaves as a velocity from a dimensionally point of view; for this reason, it may be understood that both c and h do not appear in the equations, under the pretext that they are universal constants, but we can not understand the relationship between w and m, unless the mass is electromagnetic in nature.

In addition, the mass disappears in the formulation of General Relativity, appearing some mathematical identities as equations with a terminology as curvature of "space-time", whose certainty tries to avoid any criticism or debate, because it is much a "whole" way of thinking than a "theory"; with other words, anyone continues to believe what he wants to believe: the time as a "fourth" dimension!

In this sense the ECE (Einstein-Cartan-Evans) theory aims to couple the curvature (torsion) of the electromagnetic field with the space-time curvature assigned to Gravitation, although is not possible, because in the last case it is simply a curved path of a body with real or inertial mass (Planet) that moves around another (Sun), while the torsion is made by a potential vector of the magnetic field, producing the Planet's rotation; but that potential vector can not be assumed by gravitational interaction, so the integration has to be discarded.

General Relativity may explain the Universe when this is limited to a Planetary System, where Gravitation and Electromagnetism in its quantum implication, are complementary physical theories, which is consistent with Duality (not Unification), according to Special Theory.

Strong, Weak and Electromagnetic Interactions establish the configuration of the "inner" space of the atomic nuclei, so that elementary particles such as quarks and neutrinos are set in it, while electrons and positrons and consequently gamma ray (photons) can access to the "exterior" space, but all of them with electromagnetic and virtual mass; the atomic nuclei and therefore the atoms with real (inertial) mass are manifested at the "exterior" space, according to the laws of Chemistry and Classical Mechanics.

The existence of two spaces is in line with the Dual paradigm.

It is possible to simplify the formalism used in Standard Model, among other things, because there is no need of the helicity attributed to zero masses of photons and neutrinos, neither for renormalization on account of divergences produced by the supposed rest mass.

Likewise, it may be understood the failure of gravity "quantization", notwithstanding the great amount of working devoted to this task, which is an unequivocal proof of the "failure" that a single theory, that is, the Theory of Everything, can explain all physical phenomena.

Finally, the Standard and Cosmological Model must be based on a Dual Nature: one of macroscopic dimensions (made to the measure of human being), governed by the laws of Classical Mechanics and Chemistry and another of extremely small dimensiones (subatomic particles) or enormously large (Universe), where Quantum Theory exerts its dominion, which should be in line with Evolution Theory, as it have been shown in the article: *"The adventure of Science"* (International Jopurnal of Mathematics and Physical Sciences Research. Vol. 3, Issue 2, pp:(22-32) Month: October 2015- March 2016, Available at: www.researchpublish.com

REFERENCES

[1] R. Mohapatra: "Unification and Supersymmetry". Springer (2003).

[2] S.Ctsakis: "Cosmological Crossroads". Springer. (2002).

[3] M.Kaku: "Quantum Field Theory". Oxford Univ.Press (1993).

[4] T.Cheng and L.Li: "Gauge theory of elementary Particles. Oxford. (1996).

[5] M.Berry: "Principles of cosmology and gravitation". Cambridge. (1976).

[6] S.Weinberg: "Tres primeros minutos del Universo". Alianza Univers. (1986).

[7] A.Einstein: "El significado de la relatividad". Espasa-Calpe. (1984).

[8] P.C.Davies: "Espacio y tiempo en el Universo". F.Cult.Econom.(1982).

[9] S.Hawking: "Agujeros negros y pequeños universos". P&J. (1993).

[10] P.Dirac: "General Theory of Relativity". Wiley-Intersciences. (1975).

[11] G.'t Hoof: "Distinguishing causal time from Mikowsky time". (2006).

[12] J.A.Gowan: "General Systems and Unified Field Theory". Cornell. (2005).

[13] Martin A.Pomerantz: "Cosmic Rays". Van Nostrand Reinhold (1971)

[14] D.White: "Dynamics implications and gravitationals' source"(2005)

[15] M.D.Iftime: "Gauge and General Relativity". Boston (2008).

[16] Standford Encyclopedia of Phylosophy: "Quantum Gravity" . 2005.

[17] Gary K.Au: "The Quest for Quantum Gravity". Univ.of Melbourne. 1995.

[18] H.Nicolai,..: "Loop quantum gravity: an outside view". Golm.Germany 2005.

[19] C.Quigg: "Spont.Symmetry Breaking as a Basis of Part. Mass".Fermilab(2007)

[20] A. Einstein: "The Principle of Relativity". Dover Books. (1952).

[21] Eddington: "Space, time and gravitation". Cambridge at Univ. Press. (1968).

[22] A.S.Eddington: "The Mathematical Theory of Relativity". Cambridge. (1965).

[23] A.Lichnerowicz: "Elementos de Cálculo Tensorial". Edit. Aguilar. (1965).

[24] Landau y Lifshitz: "Teoría Clásica de los Campos". Edit. Reverté. (1966).

[25] M. Bunge: "Controversias en física". Editorial Tecnos. (1983).

[26] R.B. Lindsy: "Concepts and Methods of Theoretical Physics". Dover. (1969).

[27] P.G.Bergmann: "Basic Theories of Physics". Dover Publications. (1962).

[28] J.W.Leech: " "Mecánica Clásica". Manuales UTEHA,. México. (1968).

[29] A.Guay: "Geometrical aspects of local and gauge symmetry". (2004).

[30] M.Gabella: "Non-abelian Gauge Theories. Higgs Mechanism" (2006).

[31] E. Segré: "Nuclei and Particles". W.A.Benjamin, Inc. (1972).

[32] I. Kaplan: "Nuclear Physics" . Addison-Wesley Publishing. (1962).

[33] F. Mandl: "Introduction to Quantum Field Theory". Interscience. (1959).

[34] G. Wick: "Elementary Particles". Geoffrey Chapman. 1972.

[35] P.Ander-A.Sonnessa: "Principles of Chemistry". Macmillan Co. (1965).

[36] M.W.Evans: "Spin connection resonance in grav.Gral. Relativity". (2006).

[37] C. Oakley: "The search for a quantum field theory". (2008).

[38] A. Mercier: "Analytical and Canonical Formalism in Physics. Dover Publ. (1963).

[39] H.J.Pain: "The Physics of Vibration an d Waves". John Wiley and Sons. (1968).

[40] L.Schwartz: "Métodos Matem.para las Ciencias Físicas".Selecc.Científicas (1969).

[41] K.L.Ross: "The Ontology and Cosmology of Non-Euclidean Geometry" (2006).

[42] Max Born: "Einsteins's Theory of Relativity". Dover Publication, Inc. (1965).

[43] M.W.Evans: "Spin connection resonance in Gravit.General Relat. (AIAS). (2006).