Undulatory Theory of Gravity in Minkowski Space

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Abstract

In the following work I intend to present a gravitational potential φ in a four-dimensional space, for the attempt leading to the development of a Undulatory and Geometric Theory of Gravity, whereas, for reasons of convenience and co-variance with theoretical models intended to be integrated into the standard model, it must contain the most common and known number of dimensions of a simple space; in this case the Minkowski space $\mathscr{M}^{(4)}$, is chosen, since this is a very consistent one, possesses a metric $\boldsymbol{\eta}_{\mu\nu}$ that is very similar to Euclidean $\boldsymbol{\delta}_{ij}$, and is sufficient to define the essentials of gravitation; a second objective is to demonstrate more conciliatory and adequately the concordance and covariance with Albert Einstein's Special Theory of Relativity that was elaborated in this same space, with some quantum connections and with the classical scheme in a dimensional boundary leading to Euclidean space $\mathscr{E}^{(3)}$ in which Isaac Newton developed the classical Theory of Gravitation.

Keywords: Cosmology, Fields, Gravity

Introduction

For some considerations that will be exposed, the most important feature to develop a Geometric Theory of Gravity is in the concept of vacuum, is where the key to generate the model for gravitation resides, in which we would propose to group the relevant components that display the properties of the physical vacuum which is significantly different from the mathematical vacuum, since physical emptiness is endowed with very distinguishable qualities: electrical, magnetic, can also fluctuate and generate virtual particle pairs under certain conditions; in this model, there appears a component of the initial state associated with geometry that could be associated with a set of quasi-particles that fill the void, we will call them Geones (Geon: relative to Genesis or to the minimum constituent entity of Geometry), whose energy per square meter is very small compared to other reference values of the macromund, one could suggest scale for that level of units (in geometrons, 1 geometrón $\stackrel{\text{def}}{=}$7.322545x10^{-76} J.m^{-2}), Geons are to form a Geonic Field that fills the entire Space in the company of Fermions called Gravitinos (T), super symmetric companion of Graviton (G), the latter is known as Aphoro Boson, Boson gauge or intermediate vector Boson in charge of transmitting gravitational interaction. It should be noted that, here the Geons represent the basic void state of the universe, these intervene directly in the definition of the chosen space and are indispensable for the development of the model and arise naturally in the equation of the scalar potential φ**.**

A forceful and significant step is the enlargement the dimensions of the way as there was structured the Special Theory of the Relativity (STR) and the inclusion in the model of the mentioned fundamental constants G, ħ, c, so that later other works, others could relate three interactions to the gravity. Actually this will be the attempt, to create a model that excludes the concept of mass as the only field generating entity and that expresses the other tensorial fields as the force and gravitational field from a geometric point of view, that is, this will be a model in which only points and lengths will be measured, it is by no means simply called "**The 7G Theory**" which simplifies this topic of Geons, Gravitons and Gravitinos in The Geometric Theory of Gravity Gauss-Gil; here the trajectory recovers the action from distance of Newton, the force is defined as a function of the integral curvature of Gauss, of the energy of the body characterized with its Compton wavelength or radiation, an absolute measurable associated with each particle; on the other hand, the topology of space-time does not have to be simple, even at the microscopic level, it is valid to imagine a foam structure, since each particle or body has a limited scope, not infinite, formed from the beginning; in which case, the apparent dimension of each body could exceed the actual, or failing that, could be smaller; so, the concept of a particle must be clarified, counting on one of its basic properties that can be its energy, its frequency or its wavelength and with a quantum characteristic of its gravitational interaction companion, the intermediate Boson spin. It seems inevitable to say that we are not far from realizing Einstein's dream, that all physics can be explained in geometric terms. Before continuing with the development of the model, we will see some historical background, definitions and certain characteristics of the vacuum.

Theoretical background

In the last third of the seventeenth century, Sir Isaac Newton published his studies on the movement of bodies recorded in his work "The Principia," originally called "Philosophiae Naturalis Principia Mathematica," or Mathematical Principles of Natural Philosophy, officially presented on 28 April 1686, in this publication he posits that force and gravitational field are functions directly proportional to the masses of bodies that generate interaction and inversely proportional to the square of the distances between them, that distance r is calculated by Pythagoras' theorem: $r = \sqrt{x^2 + y^2 + z^2}$ and the action of force is instantaneous, i.e. at infinite velocity, however, the concept itself is of grandiose scope and unmatched simplicity. The raw idea really comes from various physicists like Gilbert, Kepler, Boreli and Halley.

Isaac Newton, with his recognized knowledge, was responsible for bringing together all these considerations that would build a coherent model on the movement and behavior of celestial bodies associated with the paths observed in earthly bodies, these should include the mathematical and theoretical concepts developed by Nicholas Copernicus, Johannes Kepler and Galileo Galilei; for his part Halley was always condescending to his discoveries, he seems to be the one who mentioned to him the problem of trajectory of a body describing a parable to which Newton indicated that he would follow a trajectory that was governed by the inverse of the square of the distance, while scientists like the aforementioned Hooke and Leibniz devoted themselves to asking him all sorts of theoretical questions that little by little the scientific world ended up clarifying, giving credit to mankind's greatest genius, as Isaac Barrow pointed out (1630-1677) Newton's predecessor in Lucasian Chair of mathematics, a wise person who left the chair for the pulpit and which ideas were according to those of its disciple.

The mathematical and Newtonian expressions of Universal Gravitation, such as the scalar potential, the vector field of gravitation $\boldsymbol{g}$ and the vector field of force F, respectively, are:

$$\varphi = G\frac{m_1}{r}\ , \qquad \vec{g} = -G\frac{m_1}{r^2}.\hat{e}_r\ , \qquad \vec{F} = -G\frac{m_1.m_2}{r^2}.\hat{e}_r$$

With m_1 and m_2 the masses that interact gravitationally and are at a distance r of separation, $G=6.67\text{x}10^{-11}$ $N.m^2.Kg^{-2}$ is the Newtonian constant of gravity, some physicists interpret it as a kind of elasticity of space, others as the fundamental constant that measures the energy of gravitational force. Almost 100 years after Newton presented his works, the constant G was first measured by the English physicist Henry Cavendish (1731-1810), proved experimentally, that gravitation is actually a universal phenomenon. By using a torsion balance extremely sensitive to the tiny force exerted between two equal masses of lead; the torsion balance consisted of a rod suspended from a thin wire and at the end of the rod were the two masses that could rotate, thus, when the rod rotated, there was a twisting in the thin wire that held them, showed that there really is an attraction between mass pairs, being able to calculate the value of the constant (the one currently used is $G = 6.6725985\text{x}10^{-11}$ $N.m^2.Kg^{-2}$).

Later models inspired by Newton's law were developed, translated into another language by Poisson's law for a gravitation potential, with a density matter distribution, 0 a treatment could be made analogous to the case of Coulombian potential V, for a charge density distribution, which are of the form

$$\Delta\varphi = -4\pi G\delta_0 \quad \text{And} \quad \Delta V = -4\pi C\rho$$

Where C is the Coulomb constant, both expressions come from the law of the inverse of distance 1/r, present in the respective potentials

$$F_{Elec.} = -e\nabla V \quad \text{And} \quad V = C.\frac{e}{r}$$

$$F_{Grav.} = -m\nabla\varphi \quad \text{And} \quad \varphi = G.\frac{m}{r}$$

Because when Newtonian theory is applied to celestial mechanics, relative disagreements with the motion of the planet Mercury appear, this was observed by Le Verrier in 1850; for example, for this planet, the measurement of the experimental secular advance gives an angle of 572 arcseconds, when operating the perturbation corrections according to the Newtonian tables, the advance of the calculated perihelion is reduced to 530 arcseconds, as there remains a residual advance close to 42 seconds that is not explained by the Newtonian theory. Two other less marked disagreements are those noted by Newcomb concerning the advance of the perihelion of Mars (8 seconds of arc per century) and the advance of the node of Venus (10 seconds of arc per century), both of which were confirmed by Doolitle and Ross.

On the other hand, the presence of small planets does not allow attenuating certain disagreements that only generate new discordances; to avoid them Hugo Hans Ritter von Seeliger supposes a distribution of matter in five homogeneous ellipsoids of arbitrary eccentricity leading to thinking about theories of planetary motions based on homocentric spheres.

Because of these difficulties and others not mentioned, one can instead think of the repeal of Newton's law, little enough to preserve its results, but enough to compose disagreements if a law of the type is adopted

$$F = -G\frac{m_1.m_2}{r^n}.\hat{e}_r$$

The progression of perihelion n(n-2) is verified to be positive if n > 2, or negative is n < 2, (n = 2.00000016) to interpret the residual advance this was proposed by Hall, however, in 1904 Brown and then in 1905 Sitter, they showed that this correction leads to inadmissible conclusions about the motion of the Moon, resulting in a secular advance of the perihelion of 140 arcseconds, while the experience yields about 3 arcseconds.

A more precise theory explaining the anomalies of the perihelions of the rocky planets was proposed in 1906 by the Austrian-German astronomer Hugo von Seeliger: a mass distribution around the Sun with an inclination to the 7° ecliptic that was also responsible for zodiacal light. This explanation accounted for all observed anomalies and was considered correct until 1919 when a solar eclipse confirmed Einstein's theory that he had already given an alternative response to the perihelion shift in 1915. According to historians, without Freundlich's work, Einstein would never have known that Seeliger's hypothesis was not an obstacle to the development of his own theory and that explaining Mercury's perihelion anomaly should be one of the key objectives of his general theory of relativity. Other modifications to Newton's law that include the maximum speed of light (called h at those times) are as follows:

In 1805 Laplace's Law

$$\mathrm{F} = -\mathrm{G}\mathrm{m}_1\mathrm{m}_2\left[\frac{\mathbf{r}}{\mathrm{r}^3} + \frac{\mathbf{v}}{\mathrm{h}}\right]$$

In 1870 Weber's law, proposed by Holzmuller

$$\mathrm{F} = -\frac{\mathrm{G}\mathrm{m}_1\mathrm{m}_2}{\mathrm{r}^2}\left[1 - \frac{\dot{\mathbf{r}}^{\mathbf{2}}}{\mathrm{h}^2} + \frac{\mathbf{2r\ddot{r}}}{\mathrm{h}^2}\right]$$

And the law of Riemann, proposed by Liman in 1886 and Lévi in 1890

$$\mathrm{F} = -\frac{\mathrm{G}\mathrm{m}_1\mathrm{m}_2}{\mathrm{r}^2}\left[1 - \frac{(\dot{\mathrm{r}}_1 - \dot{\mathrm{r}}_2)^2}{\mathrm{h}^2}\right]$$

Hall's idea of modifying the laws of Newtonian gravity is framed in the context of new theories of gravity that became very popular at the end of the century XIX by analogy with the new electrodynamics developed by Maxwell and his contemporaries. Coulomb's law for force between two moving electric charges is modified by adding terms that depend on speed. By analogy, many proposals were made for similar modifications to the gravitational force between two moving masses. Laplace already did it in 1805 as a mere theoretical exercise, but by the end of the century. XIX each new law proposed for force between two charges implied by analogy a new proposal for gravitational force. There were many proposals, such as those of Weber, Riemann, Gauss, Clausius and Ritz. Holzmuller's proposal of gravitational force in 1870 was based on Weber's force between charges (1846), this new gravitational law was applied to the Mercury perihelion anomaly in 1872, when Tisserand demonstrated that it predicted only 14 ” per century (much less than observed). Riemann's law (Liman-Lévi) foretold 28 "(also less than observed). All these new proposals predicted anomalies less than 14 ” per century for the advance of the perihelion of Mercury, much smaller than that observed by Newcomb. Finally it was Lorentz who obtained the correct formula in 1892.

Other corrective terms have been imagined such as the history of the solution to the anomaly in the advance of the perihelion of Mercury, one of them developed by a German physicist, a schoolteacher not widely recognized in his time, named Paul Gerber in 1898. The same solution was published in 1915 by Albert Einstein[1]. Let us look at the functional form of the following equations:

$$Paul\ Gerberg\ 1898\!:\ \Psi = 24\pi^3 \frac{a^2}{\tau^2 c^2 (1-\varepsilon^2)}$$

Gerber's theory assumed that gravity propagated at the speed of light (c) and that the force between two masses had to be corrected by a term that depended on the speed at which they moved. Gerber-Einstein's formula explains the anomaly of Mercury, the rocky planets of the Solar System and even the Moon (when additional effects are corrected due to the rest of the planets and bodies of the solar system). Gerber proposed his model in 1898 and defined gravitational potential

$$V_{(r,\dot{r})} = -\frac{m}{r^2}.\frac{1}{\left(1-\frac{\dot{r}}{c}\right)^2}$$

and gravitational force:

$$f = -\frac{m}{r^2}\left(1-\frac{3\dot{r}^2}{c^2}+\frac{6r\ddot{r}}{c^2}-\frac{8\dot{r}^3}{c^3}+\frac{24r\dot{r}\ddot{r}}{c^3}-\cdots\right)$$

Gerber's work had little impact because its derivation was very unclear and years later were thought to contain plot errors[2].

The possibility remains that gravitation continues to be an open problem, however, in the time of the Newtonian model, this one was presented as the clearest, endowed with a great simplicity and the most scientific and moreover, it was the model that gave a strong blow to the speculation of the time.

In 1899 it appears in the micro-world of the slightly significant quantum physics, Max Planck introduces its famous called fundamental constant "All that of action" represented for ħ =1.05457266 (63) x10^{-34} (J.s) that measures the magnitude of the effects of the Quantum Mechanics; with a curious note at the margin, Planck observed that its constant,

[1] Filed under: Astronomy, Science, Physics, History, Characters, Physics, Relativity, Science - emulenews @ 11:05, Tags: Astronomy, Science, Curiosities, Physics, Theoretical Physics, History, Characters.

[2] Paul Gerber's theory, see the article by the Spanish physicist Jaume Giné (University of Lleida, Spain), “On the origin of the anomalous precession of Mercury's perihelion,” Chaos, Solitons and Fractals 38: 1004–1010, 2008 [in ArXiv]

when combined with the constant of the speed of light c = 299 792 458 (m/s) and the Newton gravity constant G = $6.6725985 \times 10^{-11}$ $N.m^2.Kg^{-2}$, established a system of absolute units, these dimensions today, set the scale of Quantum Gravity, from it is derived the density of Planck about 10^{93} gr/cm^3, some think that the universe had this density in early times of about 10^{-43} seconds when its temperature was 10^{22} °C, in that cosmos age the mean Energy per particle is 10^{-5} gr (Planck mass, more exactly $2.176434(24) \times 10^{-8}$Kg, alternatively, it is approximately 22 micrograms).

In his last years of life between 1900 and 1912, the physicist and mathematician Henri Poincaré turned to the theory of gravity, which somehow preceded general relativity. As established by Langevin (1914) in a memoir dedicated to Poincaré, Poincaré had derived covariant equations of gravitation that correctly predicted the direction of the precession of Mercury's perihelion. Poincaré assumed that gravity was spreading at the speed of light, and even came to mention "gravity waves." After the death of the Frenchman, David Hilbert published a development of the gravitational covariant equation, which became known as the field equation and is the cornerstone of the General Theory of Relativity[3].

In 1915, Albert Einstein proposed the General Theory of Relativity (GTR), defined in Riemann's space, considering it one of the greatest contributions to physics. It can be said to be a geometric theory of the classical gravitational field, without quantum effects. In it, the geometry of space-time (three spatial dimensions and one temporal), is dynamically determined by the bodies found in it; the space is curved and the net effect of such perturbation is the obligatory trajectory of the masses on geodesics or defined paths, thus avoiding the concept of force acting at a distance or of actions at a distance generated some field created by the presence of bodies; although GTR is defined in Riemann space, the solution to its equations were made with certain approximations of spherical symmetry and a limit of homogeneity identical to the properties presented by Minkowski space which is actually a quasi-Euclidian space.

After Relativity, it is difficult to consider the Newtonian theory as a finished model, it is suggested that it is not definitive and that there are elements of the new quantum physics that were not known, therefore, there is still much work to do to connect gravitation with the modern models of physics. For this reason, physicists from all over the world are in

[3] Facts about Henri Poincaré in:

- Bell, Eric Temple. Men of Mathematics, Touchstone, 1986. ISBN 0-671-62818-6.
- Belliver, André, Henri Poincaré ou la vocation souveraine, Paris, Gallimard, 1956.
- Galison, Peter Louis, Einstein's Clocks, Poincaré's Maps: Empires of Time. Hodder; Stoughton, 2003. ISBN 0-340-79447-X.-
- Ivor Grattan-Guinness. The Search for Mathematical Roots 1870-1940. Princeton Univ. Press., 2000

that attempt to scrutinize what are its deepest properties, characteristics and secrets. We know, in short, that no better model than that of Isaac Newton has been developed so far, since many alternative models of his time could be seen as frauds, others are somewhat trivial, and the third ones enjoy enormous complexity, a situation once criticized by Poincaré who, in his own words, exclaimed: "Euclidean space is and will continue to be the best reference system to elaborate the explanation of phenomena in physics, on the other hand, the concept of force and gravitational field must be recovered in a new theory that at least gives reason for the connection between the micro and the macro world".

If a Quantum Theory of Gravitation were to be developed from Einstein's Theory, it would be necessary to consider, in addition to the Newton constant "G" and the speed of light "c," the Planck constant "," which characterizes quantum phenomena. As mentioned above, these three constants allow defining an absolute system of scales such as mass (or energy) and a length, characteristics of gravitational interaction, which are called mass and Planck length. In the Quantum Theory of Gravitation and from a corpuscular point of view, two subatomic particles would attract each other by exchanging a new quantum called "graviton" (it is the intermediate Vector Boson responsible for transmitting the gravitational force). This interaction mediating particle would have a spin equal to 2 and its mass would be null. The graviton has not been detected experimentally to date. When calculations are carried out on such theories, the infinities that appear cannot be eliminated by the process of renormalization and the theories are not consistent.

In the 1960s, Roger Penrose and Stephen Hawking suggested that Einstein's GTR seemed incomplete, predicting infinite densities and curvatures into the past and into the future from a series of currently reasonable physical conditions; for this reason, many theorists expect an improved version of gravity. The inclusion of quantum effects would solve what the TGR lacks; the non-linearity of Einstein's Theory obliges that the long wavelengths, the energy that carries the graviton, distorts the background geometry and for short wavelengths, even the waves associated with the graviton are distorted. On the other hand, when overlapping two gravitational fields, the resulting field is not equal to the sum of the two components. In current Quantum Gravity theories, perturbation theory does not work because of Planck energies; the successive terms of the series of perturbations (or successive corrections) are comparable in magnitude. Quantifying the Gravitational Field quantifies space-time. In the Quantum Theory of Gravity, space-time is fixed and the background is not affected by quantum fluctuations but has them himself. These are difficulties that in current theories are minimized at the cost of dubious approximations; we also know that, in Planck's dimensions, the distinction between past and future is blurred.

The first Relativistic Theory of Gravitation was built by Gunnar Nordström, a little before the emergence of the GTR, Gunnar's agreed with the gravitational experiments of the moment (1913), his equations describing a curved space-time, a good basis that Einstein would develop in his GTR. Nordström's theory admitted a field produced only by resting masses and this could be his difficulty. The similarity between Coulomb's equations and Newton's equations led Gunnar to test an analogous treatment, within the principles of the Special Theory of Relativity (STR), introduces a fundamental difference between the two formally analogous expressions:

$$\square^2 V = -4\pi C\rho$$

With its corresponding theorist

$$\square^2 \varphi = -\frac{4\pi G}{c^2}.(\mu_0 c^2)$$

In its model there is changing $\nabla \longrightarrow - \square$ and of the tensile one of the second status $T=\eta_{\mu\nu}T^{\mu\nu}$, component took $T^{oo} = \rho_E$, that is the energy thickness and that it is possible to define $\rho_E = \mu_o c^2$. The principle of Nordström's theory served as the basis for the formulation of the TGR whose fundamental equation is identical

$$\square^2 \varphi = -\frac{4\pi G}{c^2}.T^{00}$$

However, this does not lead to correct predictions concerning the perihelion calculations of the planet Mercury; in particular, Nordström's theory foresees a secular delay (in absolute value) with respect to the experimental advance value[4].

Theories of Gravity in which the force manifests itself through the curvature of space-time are called Metric Theories, to which the Nordström and Einstein models belong, in which the force is replaced by the curvature of space-time that gives the shape of the trajectories that the object follows in its movement (geodesics), in these models the force is not necessary and, as already mentioned, its essence is lost.

If we take the path from another perspective, the panorama could change considerably, opening us to other possibilities of thought. We have seen that the Theories of Great

[4] See: Les Vérifification Expérimentales de la Relativité Générale, Marrie-Antoinette Tonnelat, Professeur á la Faculté des Sciences de Paris, Masson Et C[ie], Éditeurs, 1964, Pags. 16-17.

Unification GUT, aim at the unification of fundamental interactions, excluding gravity. If we include this one, we come to the GUTs' Great Supersymmetric Unification Theories; the incorporation of gravitation into a theory that unified the other three fundamental interactions is carried out by making that theory invariant under "local" Supersymmetry (i.e., a distinct Supersymmetric transformation at each point in space-time). The theory invariant under local Supersymmetry thus resulting and unifying the four fundamental interactions is known as "Supergravity" (it began to develop in 1976). The graviton, intermediate vector boson with spin angular momentum equal to $2\hbar$, will have a fermionic and Supersymmetric companion named "Gravitino," and whose spin will be equal to (3/2) $\hbar$. Gravitino, like graviton, has not yet been detected and after much work, a Supergravity Model has not been achieved that is renormalizable, that is, that can present a realistic spectrum of particles at low energies. Therefore, the problem of formulating a Quantum Theory of Gravitation that is consistent persists. Furthermore, it does not present solution possibilities within the Quantum Field Theory. It is necessary then, something new that proposes other possibilities that include both as protagonists of gravitational interaction.

A very recent attempt is made by the Theories of Strings and Superstrings, these because of their large number of dimensions (11) is somewhat tedious. In the early 1990s, it was shown that the five different theories of the Superstrings were related by dualities, which allowed physicists to relate the description of an object in a Superstrings theory to eventually describe a different object from another theory. These relationships imply that each of the Superstrings theories is a different aspect of a single theory, proposed by Edward Witten of the Institute for Advanced Study, called "M-theory", proposes the existence of parallel universes, each universe is a hyper-membrane that vibrates, the origin of the particles of our universe would have originated due to the shock of two membranes in that state of vibration, but not from a big explosion as the Big Bang theory states.

Another recent alternative is the theory of Dark Matter, which was proposed by Fritz Zwicky in 1933 to the evidence of a "non-visible mass" that influenced the orbital velocities of galaxies in clusters. Subsequently, other observations have indicated the presence of dark matter in the universe: these observations include the aforementioned speed of rotation of galaxies, the gravitational lenses of background objects by galaxy clusters, such as the Bullet Cluster (1E 0657-56) and the distribution of hot gas temperature in galaxies and galaxy clusters. According to the model, dark matter also plays a central role in the formation of structures and the evolution of galaxies and has measurable effects on the anisotropy of microwave background radiation. All of this evidence suggests that galaxies, galaxy clusters, and the entire Universe contain much more matter than interacts with electromagnetic radiation: the remainder is called "the dark matter component," the difficulty of the theory is that it is unknown or not decided what its component is, among them are the neutralino, ordinary and heavy neutrinos, elementary particles recently postulated as WIMPs and axions; these surround galaxies, astronomical bodies such as dwarf stars, planets (collectively called MACHO) and clouds of non-luminous gases. The current tests favor the models in which the primary component of the dark matter the new elementary particles are called collectively dark matter not bariónica. Until now he has not decided what its representative particle is, to determine what the nature of the dark matter is is the called "problem of the dark matter" or "problem of the missing mass" and he is one of the most important of the modern cosmology; its big contenders would be the new quantum theories of the gravity and very possibly, this one was employed at the one that they bring in in direct and natural game the Graviton (G), the Gravitino (T) and the field of Geónico, a kind of quantum of geometry.

A fundamental intention, the fact is that we will recover the notion of force and gravitational field, lost in Einstein's GTR; since others three interactions (electromagnetic, nuclear weak and nuclear fortress) obey characteristics very similar to the Newtonian model; this way, the Minkowski space presents itself as a try since it possesses a simple metrics for the formulation of this model and for the case of the bodies that fill our universe. Since it is well known theoretically, the gravity is the fourth fundamental interaction of the nature, this one hides more questions than answers and until now it is not part of the standard model; it does not act on any load, but especially type of mass or energy, also it has been said that it is an always attractive interaction, it does not allow to be framed by facility in a quantum theory. In spite of its small intensity, it is the force that determines the evolution of the Universe to cosmic scales.

The Concept of Void

Vacuum (Latin *vacīvus*)) by definition, is the total absence of matter in a given space or place, or the lack of content inside a container. By extension, the condition of a region where the particle density is very low, such as interstellar space, is also called void.

Later, with the emergence of quantum field theory, quantum vacuum (also called vacuum) is defined as the quantum state with the least energy possible. Generally not containing physical particles, the term "Zero Point Energy" is occasionally used as a synonym for the quantum vacuum of a given quantum field. According to what is currently understood by quantum vacuum or "vacuum state," this "is from no point of view a simple empty space, it is a mistake to think of any physical vacuum as an absolute empty space".[5] According to quantum mechanics, the quantum vacuum is not truly empty but contains fluctuating electromagnetic waves and particles that jump in and out of existence.

In many cases, vacuum becomes more complicated, in the space itself matter can arise spontaneously as a result of vacuum fluctuations, for example pairs (e,), particles created in this way have an ephemeral life, for they are annihilated as soon as they are born and their presence cannot be detected directly, so they are called virtual particles, to distinguish them from real particles whose life is more stable, so it can be defined in vacuum as a space that lacks real particles or as an unstable region where virtual particles can appear and disappear at time intervals of Planck's order.

The existence of the action or constant quantum of Planck (called action and is the product of an energy for a while), the basis of quantum physics, is the cause of that fundamental change and of many other changes with profound consequences. Fractal geometry is a new framework that offers alternately new and interesting perspectives.

The existence of the quantum of action really implies the disappearance of the void as such. The minimum possible energy in space (quantum fluctuations) is no longer zero to become dependent on the inverse of the distance considered. At the lowest possible distance (Planck length = 10^{-35} meters), it is associated with a considerable energy, equivalent to a mass of 0.00002 grams, and if we maintain the same ratio, the mass corresponding to one meter would be of the order of 1.2 $x10^{24}$ tons. But the very existence of the minimum amount of action described in the uncertainty principle, determines that the vacuum energy fluctuations are narrowed and are ever smaller as the distance increases. For macroscopic distances, everyday for us, they are practically nil.

The flat and stable vacuum has left way for a quantum vacuum modulated by its energy fluctuations that give it a fractal, discontinuous structure. Such a structure, apparently strange in theory, is on the contrary the most common in the real world. Any surface, for example, however smooth it may seem to us, when we examine it with a progressive increase we will observe it with ever greater imperfections, cracks and discontinuities. It happens with any real world object, sphere, cube, or perfect line don´t exist. They are still

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[5] Astrid Lambrecht (Hartmut Figger, Dieter Meschede, Claus Zimmermann Eds.) (2002). *Observing mechanical dissipation in the quantum vacuum: an experimental challenge; in Laser physics at the limits*. Berlin/New York:

Springer,p. 197.ISBN3540424180.,http://books.google.com/books?id=0DUjDAPwcqoC&pg=PA197&dq=%22vacuum+state%22&lr=&as_brr=0&sig=-gfWcR7RdymYL3W-M2VxVQPFm10#PPA197,M1.

convenient simplifications to which we associate simple and easy to manipulate concepts. However, simplifications can hide decisive details from us.[6]

The concept of mass

After the appearance of Relativity, in which the constancy of the speed of light c is verified and established, it was thought that one could formulate an alternate theory that finally does nothing but check the einsteniana, it was appropriate to raise a question as it was before Einstein's intervention and try to resolve it without adding anything to the facts that could be given as perfectly established. To begin to give this work body, let us remember that with the experiments of Eötvös in the 1890s, the equality between inertial mass and gravitational mass was verified with great precision.[7] Such facts are adapted to generate the fundamental postulates, these were:

1. It is the postulate of the inertia of energy: All energy E possesses an inertia given by:

$$m_E = \frac{E}{c^2}$$

[6] Some notes on the void were taken from www.biografias yvida.com. www.goo.gl/uQ8QgA, Halliday, David; Robert Resnick; Kenneth S. Krane (2001). Physics v. 1. New York: John Wiley & Sons. ISBN 0-471-32057-9., Serway, Raymond A .; Jewett, John W. (2004). Physics for Scientists and Engineers (6th edition). Brooks / Cole. ISBN 0-534-40842-7. Tipler, Paul Allen; Gene Mosca (2004). Physics for Scientists and Engineers: Mechanics, Oscillations and Waves, Thermodynamics (5th edition). W.H. Freeman & Company, pp. 650. ISBN 0-7167-0809-4. Wald, Robert M. (1994). Quantum Field Theory in Curved Space time and Black Hole Thermodynamics, Chicago University Press. pp. 205. ISBN 0-226-87027. http://books.google.com.ar/books?id=Iud7eyDxt1AC&printsec = frontcover & client = firefox_a & source = gbs_v2_summary_r & cad = 0. Wald, Robert M. (1984), General Relativity (12th edition). Chicago University Press. pp. 491. ISBN 0-226-87033-2.

[7] See Eötvös experiments of 1890, his experiences were designed to prove the equivalence between the inertial masses m_I and gravitational m_G of objects, understanding by inertial mass the measure of the resistance that a body presents to the change in its state of motion, while that gravitational mass is considered as a measure of gravitational attraction. The principle used in the experiments can be visualized as follows: consider a mass that is on the surface of the Earth, such mass will be subject to two forces: the gravitational, directed towards the center of the Earth and the force centrifuge, directed outward. This last force is a consequence of the daily earth rotation. In Eötvös's experiment, the balance that supported the two masses was in equilibrium with respect to the observer and oriented from East to West. Any small difference in proportionality between the gravitational and inertial forces would result in a rotation of the balance. That is, as the ratio of the forces depends on the ratio of the gravitational masses mG to inertial m_I, the appearance of a rotation would imply that m_G would not be equal to mI. Eötvös showed that, up to one part in a billion and for all the materials used, it was true that $m_G = m_I$. That is, if the masses were different, they would be at most one billionth. Dicke has recently repeated the experiment using the aforementioned apparatus, with major modifications to the Eötvös arrangement and using highly refined measurement apparatus and techniques. So far, his results agree with those of Eötvös and the equality between m_G and m_I for the substances he has used is well established at one part in 10 billion. See also the website: http://bibliotecadigital.ilce.edu.mx/sites/ciencia/volumen1/ciencia2/41/htm/sec_18.html.

This postulate was introduced by Poincaré in 1900, for electromagnetic energy and then Max Planck suggested that it should be applied to kinetic energy[8], then Einstein postulated and reinterpreted it backwards in 1905 as E = m c^2, can now be given as a fully confirmed fact. A second postulate had to do with the contraction of lengths in the direction of motion. But at the moment we are interested in postulating for the development of this work that "all energy possesses gravity," which is equivalent to enunciating a postulate analogous to that of Poincaré.

2. The postulate of gravity of energy, or is that all energy E can also generate gravity and is given by

$$m_G = \frac{E}{c^2}$$

It would then be our additional postulate of the gravity of energy and as a consequence of this, you can dispense with the mass in our next equations, additionally, making use of the equation of Planck E=2πħ.c/λ, to energy, where λ is the Compton wavelength or radiation, replacing in the previous one, we can go further and replace the definition of mass with

$$m = \frac{2\pi\hbar}{\lambda . c}$$

This definition will be included in the construction of this model.

Attempt to Generate a Geometric Gravity Model

We have mentioned that to search the secrets of gravitation it is pertinent to confront the concept of emptiness and then interpret the idea of Space; relating two concepts, it is possible to think to the gravitation how a species of elasticity of the universe, how it was conceived by Isaac Newton, our space to be defined, possesses also, electrical and magnetic properties characterized by the constants of magnetic permeability $\boldsymbol{\mu_0}$ and permitividad electricity company $\boldsymbol{\varepsilon_0}$, which are contained in the value of the speed of the light $c = 1/\sqrt{\varepsilon_0 . \mu_0}$), inside the structure to small scale of the proper universe; all this is relevant to define a theory that emerges from the microworld whose main inhabitant is **ħ** the Planck constant and makes possible and compatible its linkage with the theoretical progress that has so far been developed to interpret the gravitational phenomena of the macromund, thus, from the Geometric Model of Gravity one must derive the Classical Model of Newton Gravitation, but with some additional ingredients, it will present some quantum and relativistic traits.

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[8] See Postulates of a new theory suggested by Poincaré, Great encyclopedia of the world, Spain 1977, volume 16, pp16-366, 16-374, Durban, S.A. of Editions Bilbao, (from the same encyclopedia, see 16-372).

Definition or the $U^{(4)}$ space

Let us initially define Minkowski space, also called Minkowski space-time[9], which is a four-dimensional Lorentzian variety and null curvature. (the fact that its intrinsic curvature is null, is no impediment to defining them in it, as well as in Euclidean space curves can be defined), usually used to describe physical phenomena within Einstein's STR. We define this space $\mathcal{M}^{(4)}=(\mathbb{R}4,\eta)$, with its dual base $< e^{\mu}.e^{\nu}> = \eta^{\mu\nu}$ with the bilinear form next to the one that defines the metric, that is to say, with the metric tensor of components the (remember that the base is $\{e_{\mu}\}$, = 0,1,2,3,) plus we define the quadridistance or position vector $R = R\hat{e}_R$, as a linear combination of the base of unit vectors expanding the Minkowski space, i.e. $\mathbf{R}=x^0e_0+x^1e_1+ x^2e_2+x^3e_3$, whose magnitude R defines $R^2=x_0^2+x_1^2+ x_2^2+x_3^2$; connected with Euclidean space by representing its three coordinates or ordinary spatial dimensions and an additional temporal dimension in a single metric that form a 4-variety that allows representing space-time, $x_0 = -ct$, $x_1 = x$, $x_2 = y$, $x_3 = z$; the unitary vector is defined the same way as a linear combination of the base, $\hat{e}_R = e_0+e_1+e_2+e_3$, from these, we will define covariants tensor with tensorial components F^{μ}, $\boldsymbol{g}^{\mu}$ and the contravariants tensor with components F_{μ}, $\boldsymbol{g}_{\mu}$, the elements of 4-volume dV and 4-surface dS (called in other models by the name of Hyperplanes), the operators, invariants and the definitions of curvature that will be detailed later.

The components of the metric tensor, it is also possible to define them like this: $\boldsymbol{\eta}=dx^0\otimes dx^0+dx^1\otimes dx^1+dx^2\otimes dx^2+dx^3\otimes dx^3$ which explicitly matrix with respect to the same base, are represented as the matrix 4X4, with covariant components:

$$\eta_{\mu\nu} = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \text{, and in its form countervariant: } \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

Consider also, the T-Tensor of Matter-Energy with covariant components $T_{\mu\nu}$ is defined,

[9] The mathematician Hermann Minkowski, in 1907 realized that the special theory of relativity, presented by Einstein in 1905 and based on earlier work by Lorentz and Poincaré, could be better understood in a non-Euclidean geometry in a four-dimensional space, since then known as Minkowski space. His phrase: "The ideas about space and time that I wish to show you today rest on the solid ground of experimental physics, in which their strength lies. They are radical ideas. Therefore, space and time separately are destined to fade into the shadows and only a union of both can represent reality".

$$\boldsymbol{T}_{\mu\nu} = \begin{bmatrix} T_{00}\ T_{01}\ T_{02}\ T_{03} \\ T_{10}\ T_{11}\ T_{12}\ T_{13} \\ T_{20}\ T_{21}\ T_{22}\ T_{23} \\ T_{30}\ T_{31}\ T_{32}\ T_{33} \end{bmatrix}$$

Where energy thickness is $T_{00} = \delta_E$ And, consistently, T_{01}, T_{02}, T_{03} are components of flow of energy, T_{12}, T_{13}, T_{23}, T_{21}, T_{31}, T_{32} are six components of flow of momentum, T_{10}, T_{20}, T_{30} they represent the momentum thickness and the diagonals T_{11}, T_{22}, T_{33} Are pressure components.

On the other hand, the Riemann curvature tensor of Minkowski's space-time is identically null, which is why it is said that this space-time is flat or quasi-Euclidean, in this one however, one can define spherical figures, or in other words, hyperespherical, hypercylindrical and many others. Thus the remaining tensors and curvature scalars are null, the Einstein tensor being also null which is equal to the material content. Therefore Minkowski space is presented in SRT as an empty space, physically Minkowski space can be used as a local approximation in reasonably small regions and in the presence of matter and where the principle of equivalence and the definition of Gaussian curvature is valid. In this work I use the purpose of representing our real space, which I define as follows:

$U^{(4)} \equiv \mathcal{M}^{(4)}=(\mathbb{R}4, \eta)$ {and μ} ⊕ {Field Geónico φ_o, $M = \Sigma\ mi \neq 0$, $ET \neq 0$, $<\delta_0>$}, provided with the presence of matter and energy, more or less uniformly distributed and with an average thickness of constant matter different from zero; this way for μ=ν=0, let's consider the Tensile one of Matter - energy and we will choose for the alone prompt thing the first component one of $\mathbf{T}^{\mu\nu}$, that is to say, the energy thickness, in such a way that this one diminishes: $\mathbf{T}^{00} = \delta_E$, then with the already mentioned definition, $\delta_E = <\delta_0>.c^2$, where $<\delta_0>$ is the average thickness of matter of the universe in which the events develop.[10] Before continuing, consider the definition of Gauss curvature.

The Concept of Curvature

The Gaussian curvature of a surface is a real number $K_{(Po)}$ that measures the intrinsic curvature at each regular point P_0 of a surface. This curvature can be calculated from the determinants of the first and second fundamental forms of the surface:

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[10] $\langle \delta_o \rangle_{(3)} = 1.27 \times 10^{-24}$ Kg.m^{-3}, universe 3D, Thickness comes up of the nearby $\langle \delta_o \rangle_{(4)} = 1.078 \times 10^{-24}$ Kg.m^{-4} in universe 4D.

$$K(p_0) = \frac{LN-M^2}{EG-F^2}, \quad \text{Or equivalently:} \quad K(p_0) = \frac{b_{11}b_{22}-b_{12}^2}{g_{11}g_{22}-g_{12}^2}$$

This Gaussian curvature in general varies from point to point on the surface and is related to the main curvatures of each point (k_1 and k_2), using the ratio $K = k_1.k_2$.

A case of our interest, is the definition of surface in the 4-sphere, which by its remarkable supersymmetry has the same curvature at all its points. Calculating the Gauss curvature of a sphere (2-sphere) from the above formula it is easily arrived at that for a sphere of radius r, the Gaussian Integra curvature is equal at all points is written:

$$\mathbf{K}(\mathbf{S}) = \frac{\mathbf{1}}{|\mathbf{r_1}|} \cdot \frac{\mathbf{1}}{|-\mathbf{r_2}|}$$

$$\mathbf{K}(\mathbf{S}) = \frac{\mathbf{1}}{\mathbf{r^2}} > 0$$

Due to the absolute values the principal curvatures k_1 and k_2 are invariant under coordinate transformation, the same as the integral curvature **K(s)**. While we note that there are surfaces that have constant curvature, the Gaussian curvature should be seen as a relation $K: S \to K(S)$ where $K(S) \in C^1(S, \mathbb{R})$, (a differentiable function over S) that assigns each surface its Gaussian curvature function. In other notations, that is, in the current way of defining the Gaussian curvature is by the shape operator of the surface S: it is described $N: S \to S^2$ and defined

$$N(p) = \frac{\partial_\mu \times \partial_\nu}{\left\| \partial_\mu \times \partial_\nu \right\|} |_p$$

Where ∂μ, ∂v are the tangent vectors coordinate and are being evaluated at position p. With the derivative (Jacobian) of the operator form

$$L(p) = N'(p): T_p S \to T_{N(p)} S^2$$

A self-adjoining linear transformation, called a Weingarten transformation, is obtained, so the Gaussian curvature is the determinant of $K(p) = det[L(p)]$; it is relatively easy to verify that it matches the definition given above. In terms of the components of the Riemann curvature tensor for the differentiable 2-variety used by Einstein in his GRT in Riemann space, they contain the relation

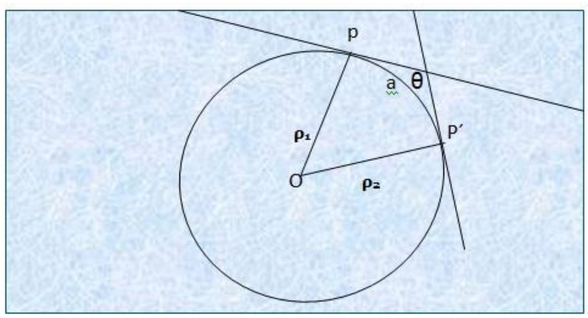
$$K = \frac{R_{1212}}{g_{11}g_{22}-g_{12}^2} \quad \text{Equivalently:} \quad \mathrm{K} = \frac{h_{11}h_{22}-h_{12}^2}{g_{11}g_{22}-g_{12}^2}$$

In our case we adapt the Gauss curvature to the Minkowski space and henceforth we will simply use the following definition.

The curvature is the limit of the quotient between the risk angle θ (that is formed by two tangent ones) and the arch to which they join its contact points P and P' on having stretched both to zero, being ρ_1 the main radio OP and ρ_2 the radio OP'. This way, extending the definition for four dimensions, we consider the radios $\rho_1=-\rho_2$, such that in some cases of symmetry, the tensile one of curvature K_ν adopts the form of the complete curvature of Gauss:

$$\mathbf{K_\nu} = \frac{\partial_\mu\ \partial_\nu\, \mathrm{x}^\mu}{(\partial_\mu x^\nu \partial_\nu \mathrm{x}^\mu)^{\frac{3}{2}}} \qquad \text{And reciprocal, widely used by Gauss: } \overline{\mathbf{K^\nu}} = \frac{(\partial_\mu x^\nu \partial_\nu \mathrm{x}^\mu)^{\frac{3}{2}}}{\partial_\mu\ \partial_\nu x^\mu}$$

Continuing with our scheme, the curvature integrates of Gauss is defined as the product of the curvatures k_1 and k_2, where $k_1=1/\rho_1$ and $k_2=1/\rho_2$, is the case in which $K_\mu = K_0$, $K=k_1.k_2=1/\rho^2$, which is only the Theorem egregiüm of Gauss[11].



The representation exaggerates the distance between P and P ', as these are actually very close in tetraspheric symmetry.

Extrapolating for four dimensions with a 4-spherical symmetry:[12]

[11] **The theorem egregiüm** (Latin: 'remarkable theorem') is a fundamental result of differential geometry demonstrated by Carl Friedrich Gauss and which refers to the curvature of surfaces. Informally, the theorem says that the Gaussian curvature of a differentiable surface can be completely determined by measuring angles and distances on the surface itself, without reference to the particular way it curves within three-dimensional Euclidean space. That is, the concept of curvature is an intrinsic invariant of a surface. Gauss formulated the theorem (translated from Latin) as: "Therefore from the preceding formula the following remarkable theorem follows by itself: If a curved surface develops on any other surface, the measure of curvature at each point - remains unchanged." Gauss considered it "remarkable" (egregiüm) because the definition of Gaussian curvature makes direct use of the position of the surface in space and therefore it is quite surprising that the result does not depend on the way in which the surface is immersed in R^3. In a more up-to-date formulation the theorem could be formulated as: **"The Gaussian curvature of a surface is invariant under local isometries."**

$$K = \frac{1}{|\rho_1|} \cdot \frac{1}{|-\rho_2|}$$

On surfaces of constant Gaussian curvature, if we have a 4-sphere of radius R, let us define identical to $R=x^0e_0+x^1e_1+ x^2e_2+x^3e_3$, whose magnitude R defines $R^2=x_0^2+x_1^2+ x_2^2+x_3^2$, we know that all points are umbilical, which implies that the principal curvatures must be equal to ± 1/R, where Therefore, this surface has constant Gaussian curvature $K = 1/R^2$, such that the reciprocal curvature is $\overline{K} = R^2$, definitions extended to Minkowski space.

<u>The Gaussian curvature is an intrinsic property of the surface, that is, it remains invariant under isometries</u>. The way to prove this theorem is by clearing the Gaussian curvature in any of the written equations, so that the Gaussian curvature can be expressed in terms of Christoffel symbols, which in turn depend on the coefficients of the first fundamental form. These equations prove the Egregio-Gauss theorem, which is one of the most important in surface theory. In Gauss's Egregiüm Theorem, the Gaussian curvature of a surface in R^3 can be expressed in terms of the coefficients of the first fundamental form.

On the other hand, let's consider the following notations for the operators that we will use, in case of the operator tensorial of D'Alembert, also called D'Alembertiano, he is an operator Cuatridimensional and he is designated by the symbol □, on having applied it on a function to climb, this one receives tensorial characteristics, it is similar to the Laplaciano $\Delta = \boldsymbol{\nabla} \cdot \boldsymbol{\nabla}$, that is used in three-dimensional spaces, $\boldsymbol{\nabla}=e^1\partial_1+e^2\partial_2+e^3\partial_3$; the D'Alembert operator can write:

$\square = \boldsymbol{\nabla} - \mathbf{e^0} \frac{\partial}{c\partial t}$, or: $\square = \mathbf{e}^{i} \frac{\partial}{\partial x^{i}} - \mathbf{e^0} \frac{\partial}{c\partial t}$ Maybe: $\square = \mathbf{e}^{\mu} \frac{\partial}{\partial x^{\mu}}$

The difference of the rotational Div. Rŏt, is also a tensile one, in different notations:

$$\square^2 = \square \cdot \square = \boxdot$$

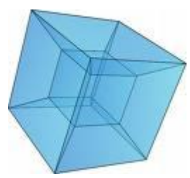
for simplicity we will notice it: $\boxdot = \mathbf{e}^{\mu} \cdot \mathbf{e}^{\nu} \frac{\partial}{\partial x^{\mu}} \cdot \frac{\partial}{\partial x^{\nu}}$, in other versions of external differential calculus is written: $\boxdot = \langle \mathbf{e}^{\mu} \mid \mathbf{e}^{\nu} \rangle \frac{\partial}{\partial x^{\mu}} \cdot \frac{\partial}{\partial x^{\nu}}$ some texts place the point on the operator, others without a point, here we will use the contravariant and simplified metric to define a wave and we write: $\boxdot = \boldsymbol{\eta}^{\mu\nu} \boldsymbol{\partial}_{\mu} \boldsymbol{\partial}_{\nu}$

[12] See Fundamental Surface Theorem and the Frobenius criterion (Pags. 51-56 and pag. 91), Avendaño Camacho Misael at http://lic.mat.uson.mx/tesis/126TesisMisael.pdf.

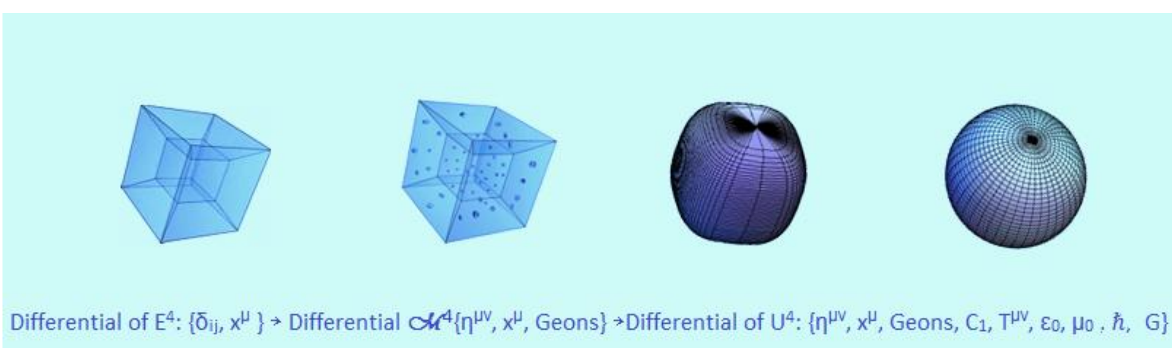
Outline of a physical body with center in its hyperespherical equipotential

We will define the body concept as that entity that possesses energy different from zero, that is to say a wave - particle with a wavelength of associate radiation λ_1 (Compton wavelength, as C_1 is endowed with D'Bröglie duality, this main quality of absolute wavelength has been chosen, since the model is developed within that geometric point of view, we will therefore omit referring to it as a particle, so it can be dispensed henceforth with the concept of mass, all this from the next approach.

Consider a small differential of space in a vacuum state or state of least possible energy contained in a tiny 4-cube that is simply a geometry portion of space-time.



It would spontaneously begin to curve on its surfaces, as it appears below, this means that the absolute geometric vacuum we have already conceived as non-existent, at least in our universe, the remaining entities of empty space as the so-called scalar bosons, in this model they will be conceived by tiny entities of pure geometry, quasi-particles or granules that we will call Geones and which together form a Geonic field (Geon: of genesis or generators of geometry), one can propose a scale of measure of energy, for example in geometrons, given its low value with respect to the macromund, to the field of Geones we theoretically assign a value of **7.322545×10^{-76} J.m^{-2} $\stackrel{\text{def}}{=}$ 1 Geometron**, which is the energy per square meter of this Geonic Field, this value will be found later.



Transformation of the space with the Ingredients of the model, credit : http://goo.gl/G6xds3

Imagine how space is transformed by adding ingredients: Thus starting from space 4-Euclidiano:

E^4: {δ_{ij}, x^μ } → Space $\mathcal{M}^{(4)}${$\eta^{\mu\nu}$, x^μ, Geons} →Universe U^4: {$\eta^{\mu\nu}$, x^μ, Geons, C_1, $T^{\mu\nu}$, ε_0, μ_0,, $\hbar$, G} in such a way that, the first pseudo-Euclidean hyperbucket 4-dimensional is transformed into the second Quasi-spherical hyperbucket by the presence of the components of the Geometric gap and with the Geonic field; then we add a physical body C_1 with energy or mass other than zero and its presence is felt by the Geons (quantum granules of geometry), these react with the presence of a physical body that will be at the center of the 4-Volumen differential, originating a significant change in the surface that now has a defined curvature with the spherical supersymmetry of the bubble effect, the definition is well known:

"Since the spherical shape is the simplest, it has equal symmetric distribution of energy, so that the surface subjected to the force or tension generated, tends to contract until occupying the minimum area compatible with the limits of the surface and with the differences of pressures on the opposite faces of the same (this is the bubble effect), similar to a liquid drop not subjected to other external forces in free motion in the vacuum, always has the spherical shape since for a given volume, it is the sphere that has less area than any other geometric shape. "[13]

In short, the small portion of the Pseudo-Euclidean space $E^{(4)}$ becomes the small portion of the Minkowski space $\mathcal{M}^{(4)}$endowed with its metric, plus a Geon Field. (which are to fill the totality of the universe) thus conforming our physical space $\mathbf{U}^{(4)}$ {$T^{\mu\nu}$, ε_0, μ_0, $\hbar$, G}, with elasticity properties recorded in the Newtonian constant G, with the electrical and magnetic properties contained in the maximum velocity constant possible to traverse the space and the Planck quantum constant of the Micro-world, the inhabitants of the Universe constitute these, after introducing the body C_1 that we characterize with the notation [C_1, λ_1] inside the child cuadrivolumen with insignificant energy that does it to remain invariant, passed a small time ($t = \rho/c$); the 4-volume of a ρ radius tetrasphere is defined:

$$\boldsymbol{V = \frac{\pi^2 \rho^4}{2}}$$

Whereas, the 4-surface of the tetravolumen is the derivative of the above:

$$\boldsymbol{S = 2\pi^2 \rho^3}$$

View volume table based on the size of the space at the end of this document.

In the language of Multilineal Tensorial Algebra, the volume differential dV is defined by the use of the Levi-Civita ε tensor of components made up of coefficients $\varepsilon_{\mu\nu\rho\sigma}$ of the volume quadriform, i.e.:

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[13] See Theory of stability.

$$\boldsymbol{\varepsilon} = \sum_{\mu<\nu<\rho<\sigma} \boldsymbol{\varepsilon_{\mu\nu\rho\sigma}} \, . \, \mathbf{dx^{\mu} \wedge dx^{\nu} \wedge dx^{\rho} \wedge dx^{\sigma}}$$

$$\boldsymbol{dV} = \boldsymbol{\varepsilon_{0123}} \mathbf{dx^0 \wedge dx^1 \wedge dx^2 \wedge dx^3} = \boldsymbol{S}$$

In general, any cuadriforma is proportional to ε, be tensile or cuadrivector only one, it generates the elements of volume of $\mathbf{M_4^*}$ and is called cuadriforma volume element, tetrasuperficie or simply surface element of the tetraesfera, its components form the Levi-Civita tensile one. In general any quadriform is proportional to **ε**.

Defined our space of events or our Universe that is only the geometric description of the space of Minkowski joined the concept of the basic state of the physical gap and the presence of physical bodies U^4**: {$\eta^{\mu\nu}$, x^{μ}, Geónes, $T^{\mu\nu}$, ε_0, μ_0, $\hbar$, G};** I will begin the sequence of the work to generate the gravitational potential φ from which there stems tensile countervariant of Geometric Field of Gravitation $\mathrm{G} = \eta_{\mu\nu} \mathrm{G}^{\mu} e^{\nu}$, The Gravitational Potential Energy $\mathbf{U_{(R)}}$**;** we will recover likewise the concept of Force of Gravitation $F = \eta_{\mu\nu} \mathrm{F}^{\mu} e^{\nu}$, with the definition of the field tensorial status countervariant 1, also called tensile of field of the type $[^1{}_0]$ in the frame of the already definite space.

Let's determine initially the tensile one of gravitational field $\boldsymbol{g}$ consisted of a gravity field $-\boldsymbol{g}^{\nu}$ attractive type (generated by the body) and a gravitational anti-camp (generated by the universe) with components $+\overline{\boldsymbol{g}}^{\boldsymbol{\mu}}$ repulsive type, so we will graphically have incoming field lines associated with the first and outgoing field lines associated with the second, $\boldsymbol{g}$ we can represent:

$$\boldsymbol{g}_{(\mathbf{R})} = -\boldsymbol{g} + \overline{\boldsymbol{g}}$$

In components:

$$\boldsymbol{g} = \boldsymbol{\eta}_{\boldsymbol{\mu\nu}} (\boldsymbol{g}^{\boldsymbol{\mu}} + \overline{\boldsymbol{g}}^{\boldsymbol{\mu}}) \mathbf{e}^{\boldsymbol{\nu}}$$

We will focus on finding these components more explicitly and show that they can be represented as tensorial functions of gravity and antigravity that depend on the curvature tensor and its reciprocal, respectively as follows:

$$\boldsymbol{g} = -\boldsymbol{g}_{(,\boldsymbol{K})} + \overline{\boldsymbol{g}}_{(\,\overline{\boldsymbol{K}})}$$

To produce this let us take the small space-time differential, that is, a small differential of the scalar gravitational potential **dφ:**

$$\mathbf{d\varphi = \left[AE_1\, d\rho + \left(\frac{B3\pi^2\, \rho^4 T}{2}\right) d\rho\right] K}$$

$$\mathbf{d\varphi = \left[AE_1\, d\rho + \left(\frac{B3\pi^2\, \rho^4 \delta_E}{2}\right) d\rho\right] K}$$

Where A and B are dimensional constants to be determined, E1 is the energy of the body C_1, K the curvature tensor, d, is the radius differential, that goes from the center of the body to a point P as defined in the curvature Integra K and T is the energy-matter tensor used in Nordström Theory and Relativity Theory, it has Tensorial components, with which, considering a homogeneous and isotropic region with a constant energy density, we would take its first component $\mathbf{T^{oo} = \delta_E}$**,** this one in turn one can transform in thickness of matter as the equation of the SRT, thus for a homogeneous distribution, $\mathbf{\delta_E = \langle \delta o \rangle . c^2}$ or so $\langle \boldsymbol{\delta} \mathbf{o} \rangle = \boldsymbol{\delta}_\mathbf{E}/\mathbf{c}^2$

By replacing this in the previous equation, we have

$$\mathbf{d\varphi = AE_1 K\, d\rho + \left(\frac{B3\pi^2\, \rho^4 \langle \delta_0 \rangle c^2}{2}\right) K\, d\rho}$$

Integrating above all the homogeneous space with integrated curvature of Gauss constant $\mathbf{K^o = 1/\rho^2}$ and through the whole distance R, we write

$$\mathbf{\int_{\varphi_0}^{\varphi(R)} d\varphi = \int_{R_0}^{R} AE_1 K^0 d\rho + \int_{R_0}^{R} \left(\frac{B3\pi^2\, \langle \delta_0 \rangle c^2 \rho^4}{2}\right) K^0 d\rho}$$

Ie,

$$\mathbf{\int_{\varphi_0}^{\varphi(R)} d\varphi = \int_{R_0}^{R} \frac{A\, E_1}{\rho^2} d\rho + \int_{R_0}^{R} \frac{B3\pi^2\, \langle \delta_0 \rangle \rho^4}{2\rho^2} d\rho}$$

As long as the constant values come out of the integral, we have

$$\mathbf{\int_{\varphi_0}^{\varphi(R)} d\varphi = AE_1 \int_{R_0}^{R} \frac{1}{\rho^2}\, d\rho + \frac{B3\pi^2\, \langle \delta_0 \rangle c^2}{2} \int_{R_0}^{R} \rho^2 d\rho}$$

$$\varphi_{(R)} - \varphi_{(0)} = AE_1 \int_{R_0}^{R} \frac{1}{\rho^2}\, d\rho + \frac{B3\pi^2 \langle \delta_0 \rangle c^2}{2} \int_{R_0}^{R} \rho^2 d\rho$$

With the constants: **A=-G.c^{-2} y B=G.c^{-2}, suitable** to the units of the potential and substituting the energy E_1 in terms of the radiation wavelength, we have

$$\varphi_{(R)} - \varphi_{(0)} = -\left[\frac{2\pi\hbar G}{\lambda_1 c}\right] \int_{R_0}^{R} \frac{1}{\rho^2}\, d\rho + \left[\frac{3\pi^2 \langle \delta_0 \rangle G}{2}\right] \int_{R_0}^{R} \rho^2 d\rho$$

Integrating in the first term arises a minus sign that is annulled, we have

$$\varphi_{(R)} - \varphi_{(0)} = \left[\frac{2\pi\hbar G}{\lambda_1 c}\right] \frac{1}{R} \Bigg|_{R_0}^{R} + \left[\frac{3\pi^2 \langle \delta_0 \rangle G}{2}\right] \frac{R^3}{3} \Bigg|_{R_0}^{R}$$

Distributing integration limits makes it easy to express:

$$\varphi_{(R)} - \varphi_{(0)} = \left(\left[\frac{2\pi\hbar G}{\lambda_1 c}\right] \frac{1}{R} + \left[\frac{\pi^2 \langle \delta_0 \rangle G}{2}\right] R^3 \right) - \left(\left[\frac{2\pi\hbar G}{\lambda_1 c}\right] \frac{1}{R_0} + \left[\frac{\pi^2 \langle \delta_0 \rangle G}{2}\right] R_0^3 \right)$$

The first parenthesis is the state of the Scalar Geometric Potential(R) of the body interacting with the nearby universe and the second parenthesis is the intrinsic potential of the basic state of the universe or initial scalar potential **$\varphi_{(o)}$**, is the basic state of the vacuum that is defined from a small potential that acts on its own surface with its own radius of action, interacting with the space-time itself, henceforth we will call **$\varphi_{(o)}$** Geonic field potential, its presence and essence must not be lost, therefore, its existence is assured in the result of this equation.

For now, let us focus our interest on the first term that generalizes the potential, note that this has two terms, one corresponds to the **action** of the body with the near or near environment, the other is the contribution of **reaction** exerted by the universe against the presence of the body:

$$\varphi_{(R)} = \left[\frac{2\pi\hbar G}{\lambda_1 c}\right] \frac{1}{R} + \left[\frac{\pi^2 \langle \delta_0 \rangle G}{2}\right] R^3 + \varphi_{(0)} \qquad (1)$$

Name the constants of the square brackets with the letters **α** and β, respectively

$$\boldsymbol{\alpha} = \left[\frac{2\pi\hbar G}{c}\right]$$

$$\boldsymbol{\beta} = \left[\frac{\pi^2 \langle \delta_0 \rangle G}{2}\right]$$

When calculating your values according to the equivalence of the other constants you must:

$\alpha = 1.5 \times 10^{-52}$ ($m^4.s^{-2}$), is an electro-gravitational-quantum constant that represents an accelerated variation of the 4-Volumen,[14] a particularly puzzling result, because it is not a velocity but an accelerated change that seems in accordance with the model of the Exploding Universe and the predictions of the Inflationary Model.

$\beta = 4.94 \times 10^{-52}$ (s^{-2}) makes us think of a frequency squared, a state of natural vibration of the universe, which is compatible with the main argument of some modern theories claiming that the universe vibrates[15], although there could be another interpretation, due to its resemblance to the cosmological constant of GRT, which has the same dimensions and a value $\Lambda = 4 \times 10^{-35}$ s^2, on the other hand, its reverse is equivalent to 6.42×10^{43} years... ¡¿suggests that it may represent the age of a stage or cycle of the universe!?, all this requires further analysis in order to free us from speculation.

We obtain the tensile one of gravitational field applying to the potential $\varphi_{(\mathbf{R})}$ the D'Alembert operator □ in analogy with the Laplaciano **∇** applied in the Newtonian model, that is to say that, the Tensile one of gravitational Field $\boldsymbol{g}$ defines as the cuadrigradiente of the gravitational potential φ:

$$\boldsymbol{g}_{(\mathbf{R})} = \Box\varphi$$

[14] Calculation with improved values of the constants (1986), gives us $\alpha = 1.4747\ (810) \times 10^{-52}$ (m4.s^{-2}). The other constant $\beta = 4.94 \times 10^{-52}$ (s^{-2}), is a kind of cosmological constant and is Positive, note its similarity with that of the GRT.

[15] Observations made in the late 1990s of distance-redshirt relationships indicated that the expansion of the universe is accelerating. Combined with measurements of the cosmic microwave background, they yielded an analogous value at the cosmological level, precisely for the Cosmological constant **$\Lambda \sim 4 \times 10^{-35}$ s**$^{-2}$. There are other possible causes for this accelerated expansion, such as the quintessence, but the cosmological constant within the standard cosmological Lambda-CDM (Dark Matter Model) is a solution and reason for current research. See more details about this constant at:
https://es.wikipedia.org/wiki/Constante_cosmológica.

When applied to equation (1), the operator acts on the potential by providing it with vector properties, rather, tensorial, where the sense and direction come from the action of the same on the scalar field, it has:

$$\boldsymbol{g}_{(\mathbf{R})} = \mathbf{e}^{\mu} \frac{\partial}{\partial x^{\mu}} \varphi$$

$$\boldsymbol{g}_{(\mathbf{R})} = -\left[\frac{2\pi\hbar G}{c}\right]\frac{1}{\lambda_1}\cdot\frac{1}{R^2}\,\hat{e}_R + \left[\frac{3\pi^2\langle\delta_0\rangle G}{2}\right]R^2\,\hat{e}_R$$

$$\boldsymbol{g}_{(\mathbf{R})} = -\frac{\alpha}{\lambda_1}\cdot\frac{1}{R^2}\,\hat{e}_R + 3\beta.\,R^2\,\hat{e}_R \qquad (2)$$

It is evident that the gravitational field tensor $\boldsymbol{g}$ appears composed of a negative gravity field $\boldsymbol{g}^{\mu}$ and a positive antigravity field $\overline{\boldsymbol{g}}^{\mu}$; graphically we would have incoming field lines associated with the first and outgoing field lines associated with the second. The universe pulls the body with outgoing lines and the physical body reacts with incoming lines creating the attraction of gravity, those lines are followed as a path by some other body that enters its domain and the result will be to fall to it, joining him, so the other forces should function or be explained, I refer to the other three interactions of nature, through processes of action and reaction.

Let's remember that the radial unitary vector is $\hat{e}_R = e_0+e_1+e_2+e_3$, therefore, to the tensile one of gravitational field $\boldsymbol{g}$, for μ = ν, we can represent it:

$$\boldsymbol{g} = \eta_{\mu\nu}\left(\boldsymbol{g}^{\mu} + \overline{\boldsymbol{g}}^{\mu}\right)\mathbf{e}^{\nu}$$

This tensor is separable in components $\boldsymbol{g}^{\mu} \Rightarrow (\boldsymbol{g}^0, \boldsymbol{g}^1, \boldsymbol{g}^2, \boldsymbol{g}^3)$) and can be generalized for different values of curvature since in certain regions of space, this does not appear perfectly symmetrical, due to the shapes of the bodies or their distorted influences. It is also necessary to redefine the concept of particle, it has been chosen to define better the concept of physical body (Remember that Newton in the principia spoke not of particles but of bodies) that equipped with mass or energy, with qualities of wave or corpuscle as appropriate, is always accompanied by four types of intermediate vector bosons to relate them to other bodies through the four interactions (weak nuclear, strong nuclear, electromagnetic and gravitational), in our case, which is gravitational, mass or energy can be characterized by a wave property, the wavelength of radiation or the frequency associated with it, given the dual properties of bodies.

the generalization would then contain a procedure that allows us to identify the spin of the graviton $Ş_G = 2\hbar$ that accompanies body one and the curvature in the first term and the spin of Gravitino $Ş_T$ =(3ħ/2) which would be associated with the space and reciprocal of the curvature in the second term, a C_1 body would be represented for gravitational interaction with the bracket [2ħ, λ_1], and the near universe shall refer to the average quantity of matter, that is, the average density would be accompanied by a characteristic of Gravitino, its spine and this pair is represented [3ħ/2, <δ_0>], so that the gravitational field can be expressed as a geometric entity containing the wavelength, the respective spines, the curvature and its reciprocal, then the field is written:

$$\mathcal{g}_{(Ş_G,\ Ş_T,\ K,\ \bar{K})} = -\frac{Ş_G}{\lambda_1}\left(\frac{\pi\ G}{c}\right).\mathbf{K}\ \hat{\mathbf{e}}_R + Ş_T\left(\frac{\pi^2\langle\delta_0\rangle G}{\hbar}\right)\cdot\bar{\mathbf{K}}\ \hat{\mathbf{e}}_R + \mathcal{g}_0 \qquad (2a)$$

This was the expression we wanted to find, a Tensorial function that depends on the spines, the curvature and its reciprocal that can also be called anti-curvature. It is convenient to interpret the two constants that appear in the two parentheses:

$\left(\frac{\pi\ G}{c}\right) = \mathbf{7 \times 10^{-19}}\ (\boldsymbol{m.s^{-1}Kg^{-1}})$**,** is a constant with electromagnetic-gravitational characteristics, which also naturally comes out as a result, has dimensions of velocity per unit mass.

$\left(\frac{\pi^2\langle\delta_0\rangle G}{\hbar}\right) = \mathbf{2\pi\ (hz.m^{-3}Kg^{-1})}$, it is equivalent to 6.283563387 (hz/m3.kg), a truly strange value.!, a frequency of vibration of 2π hertz for every kilogram of mass wrapped in one cubic meter (tri-volume), if everything vibrates, this effect might generate large-scale sounds, that is to say, it is possible to listen to the vibration of the space itself. The latter is a kind of quantum and cosmological constant that comes naturally from mathematical treatment. It could be interpreted as the vibration per kg of mass in a cubic meter of volume.

Evaluating the limits of the components, that is, the scalar part of the Gravitational Field Tensor, in the ec. (2), when the $\boldsymbol{g}$ Field becomes zero, we can clear a critical radius $\mathbf{R_c}$, it can be concluded that the gravitational field generated by the presence of a body has no infinite scope, has a limited scope as mentioned and has a critical value for the microworld that depends on its very components and the characteristics of its environment, interestingly, this critical radius does not depend on the Newtonian constant G:

$$\mathbf{R_c} = \sqrt[4]{\left(\frac{4\hbar}{3\pi c\lambda_1\langle\delta_0\rangle}\right)}$$

That in the macro-world can be represented by exchanging the wavelength for its mass equivalent, by the following expression:

$$\mathbf{R_c} = \sqrt[4]{\left(\frac{2m}{3\pi^2\langle\delta_0\rangle}\right)}$$

For example: for the Sun Rc=3.42×10^{13}m, the Earth has a range of $R_{cE}=1.43\times10^{12}$m, which gives us 10 times its radius of orbit that is $R_{oE}=1.49\times10^{11}$m, the Moon has a critical radius of $R_{CM} = 4.75\times10^{11}$m and an orbital radius of $R_{oM}=0.39\times10^{9}$m, Saturn $R_{cS}=5\times10^{12}$m and an orbital is $R_{oS}= 1.43\times10^{12}$m, Jupiter has a critical radius of $R_{cJ}=7.1\times10^{12}$m and an orbital radio of $R_{oJ}=7.78\times10^{11}$m. However, the critical radius of gravitational domain or range will always tend to be greater than or equal to the orbital. On the other hand in the microworld, the gravitational range, for example for the electron is 1.2 cm, for the proton is 9.3 cm, and the neutron defines a radius of 9.6 cm.

In the universe there are isolated bodies of gravitational influence from others, because they can be very distant, then, which holds them together to a system or cluster?, - The field of Geometry (which here in this work we call Geons and Gravitinos), composed of an almost undetectable matter-energy that the Theory of Everything gives it the name "Dark Matter."

With equation (1) we can also define the gravitational potential energy U that appears by the presence of a second body with energy other than zero in the vicinity of the first:

$$\mathbf{U_{(R)}} = \boldsymbol{\varphi}_{(\mathbf{R})}\cdot\left[\frac{2\pi\hbar}{c\lambda_2}\right]$$

$$\mathbf{U_{(R)}} = \left[\frac{2\pi\hbar N}{\lambda_1 c}\right]\left[\frac{2\pi\hbar}{c\lambda_2}\right]\frac{1}{\mathbf{R}} + \left[\frac{\pi^2\langle\delta_0\rangle N}{2}\right]\left[\frac{2\pi\hbar}{c\lambda_2}\right]\mathbf{R}^3 + \varphi_{(0)}\left[\frac{2\pi\hbar}{c\lambda_2}\right]$$

$$\mathbf{U_{(R)}} = \left[\frac{2\pi\hbar G}{c\lambda_1}\right]\left[\frac{2\pi\hbar}{c\lambda_2}\right]\frac{1}{\mathbf{R}} + \left[\frac{\pi^2\langle\delta_0\rangle G}{2}\right]\left[\frac{2\pi\hbar}{c\lambda_2}\right]\mathbf{R}^3 + \mathbf{U_{(0)}}$$

$$\mathbf{U_{(R)}} = \left(\frac{4\pi^2\hbar^2 G}{c^2}\right)\left(\frac{1}{\lambda_1\lambda_2}\right)\frac{1}{\mathbf{R}} + \left(\frac{\pi^3\hbar\langle\delta_0\rangle G}{c}\right)\left(\frac{1}{\lambda_2}\right)\mathbf{R}^3 + \mathbf{U_{(0)}} \qquad (3)$$

In this equation one can see that $\boldsymbol{U_{(0)}}$ is the energy associated with the Geonic Field, that is, the interaction energy between the Geonic Field (basic state of physical void) and the test body C_2.[16] You can see that the gap or state of the zero point, interacts with neutral matter and manifests in very small quantities, but that are not zero, in quantum mechanics the void and extremely active and has more noticeable effects, with an intense flow of energy going in all directions, this way it is more detectable, using the Lamb effect (from Nobel laureate Willis Lamb) shows this energy exchange between charged particles and void, is real and generates real effects that can be measured. On the other hand, we define here the field energy as positive, because if it were negative a body would generate energy by being gravitating, so its total energy would infinitely increase; Physicist Stephen Hawking agrees with this view. Calling the constants:

$\mathrm{H} = \frac{\mathbf{4\pi^2\hbar^2G}}{\mathbf{c^2}} = \mathbf{3.25961(52840)x10^{-94}}\ \ (\mathbf{J.m^3})$**,** is a constant unifier obtained across the whole process, he contains the objects of the world, also it is possible to interpret in accordance with the units N.m4 but in case of the next force definition, both dimensional groups need of an analysis and interpretation.

$\boldsymbol{D} = \frac{\mathbf{\pi^3}\ \hbar\langle\mathbf{\delta_0}\rangle\mathbf{G}}{\mathbf{c}} = \mathbf{7.3225x10^{-76}}\ (\mathbf{J.m^{-2}})$**,** the other universal constant that contains the average density of the universe, is related to the Whole, for numerical and dimensional reasons, can be called: frequency constant of the universe, it would not be strange for someone to call it the constant of God, it is a quantum-electromagnetic-gravitational constant, i.e. It is the energy per square meter of the geometry field, which we have called the Geonic Field, for others it could simply be dark energy, for me it represents the energy scattered throughout the universe so that it exists with the stability properties that it itself possesses; this constant has dimensions reducible to Kg/s^2, i.e., $Kg.hz^2$, if we allow ourselves to analyze it a little again, an acceleration of the universe is insinuated and this effect appears in almost all constants, in another instance, this value could be related to the vibrating mass of Gravitino = $7.3225x10^{-76}$ $Kg.hz^2$ or to the mass equivalent of the Geonic granular field, that order of magnitude is close to that predicted by different models where it turns out that the graviton mass is between $1.6x10^{-49}$ Kg and $1.78x10^{-69}$ Kg, therefore, the value found is a thousand times farther from that interval.

[16] The high energy gamma rays could experimentally determine the size of the Geons, although I do not think it probable, they would turn out to be very small on the order of 10-48 m, in addition, they should "twist" more than the low energy ones; the presence of Geons or quantum granules of geometry, would alter the way in which gamma rays propagate through space by changing the direction in which they oscillate, a property called polarization. Look for differences in polarization of the high and low energy gamma rays emitted during one of the gamma ray bursts (GRBs) that are also generated when a massive star collapses into a neutron star or when a black hole feeds on debris of a supernova, phenomena that emit a great pulse of gamma rays that lasts only a few seconds, but that get brighter than an entire galaxy.

"I am inclined to say that these found constants, can be related to the joint mass of primitive granules of geometry, with the Gravitons that accompany each particle, the field of Geones and Gravitinos, all these in group flood every corner of our universe that expands accelerately, in such case, Physical bodies, Gravitons (Intermediate vector bosons), Geons (Granular Field of Geometry) and Gravitinos (Fermionic Field) constitute a large interwoven network of relationships that connect all the bodies of the Universe. I imagine a field of very small geometric entities surrounding all existing bodies and generating in their surroundings tensions between pairs of bodies that manifest themselves with curvature effects, keeping them under mutual influences of forces attraction and repulsion with a transiting Energy that is transmitted at the speed of light in the form of waves; A network where no component can be isolated from totality, this would be my mechanical explanation of gravity... "

In order to avoid possible confusion, the mass of the Higgs Boson is 125 Gev, i.e., $2x10^{-8}$ Joules, whereas, the mass of the Geonic field has a value 3.6 x 10-69 times less than that of the Higgs field, therefore, there are notable differences, however, we cannot rule out some future connection...

The first-order gravitational force field tensor is obtained by applying the D'Alembert operator to the gravitational potential energy, ec. (3)

$$\vec{\mathbf{F}}_{(\mathbf{R})} = \Box \mathbf{U} \,,$$

$$\vec{\mathbf{F}}_{(\mathbf{R})} = -\left[\frac{2\pi\hbar G}{c\,\lambda_1}\right]\left[\frac{2\pi\hbar}{c\,\lambda_2}\right]\frac{1}{R^2}\,\hat{\mathbf{e}}_{\mathbf{R}} + \left[\frac{3\pi^2\,\langle\delta_0\rangle G}{2}\right]\left[\frac{2\pi\hbar}{c\,\lambda_2}\right]R^2\;\hat{\mathbf{e}}_{\mathbf{R}} + \mathbf{F}_{(0)} \qquad (4)$$

Note that F is a field tensor composed of two tensors that are in turn separable in components, given their nature of operational origin. The first term is negative and represents the field gravitational force or attractive type tensor, the second term is positive and is a repulsive type tensor, is an anti-gravitational force field. For simplicity we will omit the vector description $\vec{\mathbf{F}}$ and henceforth refer to force as the gravitational force field tensor F, since we know that it depends on R and the basis of unit vectors, identical with the other tensors. This tensor can be written:

$$\mathbf{F}_{(\mathbf{R})} = -\left(\frac{4\pi^2\hbar^2 G}{c^2}\right)\left(\frac{1}{\lambda_1\,\lambda_2}\right)\frac{1}{R^2}\,\hat{\mathbf{e}}_{\mathbf{R}} + \left(\frac{3\pi^3\,\hbar\langle\delta_0\rangle G}{c}\right)\left(\frac{1}{\lambda_2}\right)R^2\;\hat{\mathbf{e}}_{\mathbf{R}} + \mathbf{F}_{(0)} \qquad (4a)$$

Let us recognize the same constants defined in energy:

$\text{H} = \frac{4\pi^2\hbar^2 G}{c^2}$, which is equivalent to 3.2598 (64873) x10^{-94} J.m^3 and $3D = \frac{3\pi^3\,\hbar\langle\delta_0\rangle G}{c}$, is three times the frequency constant of potential energy, it contains the average density of the universe and is equivalent to 2,196763548x10^{-75} J.m^{-2}, their dimensions can also be expressed in Kg.hz^2, as indicated, suggests properties that characterize the behavior of the universe as a vibrating macro-object, its result may be compatible with the proposal of M theory, in which a vibrating universe or membrane is assumed.

In tensorial language, you can write the force field into separable components, so

$$\mathbf{F} = \; -\boldsymbol{\eta}_{\mu\nu}\,\mathbf{F}^{\nu}\,\boldsymbol{e}^{\mu} + \; \boldsymbol{\eta}_{\mu\nu}\,\bar{\mathbf{F}}^{\mu}\boldsymbol{e}^{\nu}$$

Or simply,

$$\mathbf{F} = \; \boldsymbol{\eta}_{\mu\nu}\,(-\mathbf{F}^{\mu} \; + \bar{\mathbf{F}}^{\mu})\mathbf{e}^{\nu}$$

The tensile previous one also can be represented according to the curvature of Gauss $\mathbf{K}^{\mu}$ and its reciprocal $\bar{\mathbf{K}}^{\mu}$, identically how in the description of the field $\boldsymbol{g}$, the porcupines of the gravitons corresponding to the bodies one and two: $Ş_{G1}$, $Ş_{G2}$ and the gravitino $Ş_{T}$ contributed by the universe in the following widespread form:

$$\mathbf{F}_{(\mathbf{R})} = -\left(\frac{\pi^2\;G}{c^2}\right)\left(\frac{Ş_{G1}\cdot Ş_{G2}}{\lambda_1\,\lambda_2}\right).\mathbf{K}^{\mu}\;\mathbf{e}_{\mu} + \left(\frac{\pi^3\,\langle\delta_0\rangle G}{\hbar c}\right)\left(\frac{Ş_{T}\cdot Ş_{G2}}{\lambda_2}\right)\cdot\bar{\mathbf{K}}^{\mu}\,\mathbf{e}_{\mu} \quad + \mathbf{F}_{(\mathbf{0})} \qquad \textbf{(4b)}$$

You can write the components of this tensor as follows:

$$\mathbf{F}^{\nu} = \boldsymbol{\eta}^{\mu\nu}\left[-\widetilde{\mathbf{H}}\left(\frac{Ş_{g1}.Ş_{g2}}{\lambda_1\,\lambda_2}\right)\mathbf{K} \; + \widetilde{\boldsymbol{D}}\left(\frac{Ş_{\gamma}\cdot Ş_{g2}}{\lambda_2}\right)\bar{\mathbf{K}}\;\right]\mathbf{e}_{\mu} + \mathbf{F}_{(\mathbf{0})} \qquad (\mathbf{4c})$$

With K = 1/R2 and its reciprocal K̅=R^2, we can go a little further and write the explicit generalized form for not-so-spherical bodies:

$$\mathbf{F}^{\nu} = \boldsymbol{\eta}^{\mu\nu}\left[-\widetilde{\mathbf{H}}\left(\frac{Ş_{g1}.Ş_{g2}}{\lambda_1\,\lambda_2}\right).\frac{\partial_{\mu}\,\partial_{\nu}\,\mathbf{x}^{\mu}}{\left(\partial_{\mu}x^{\nu}\partial_{\nu}\mathbf{x}^{\mu}\right)^{3/2}} \quad + \widetilde{\boldsymbol{D}}\left(\frac{Ş_{\gamma}\cdot Ş_{g2}}{\lambda_2}\right).\frac{\left(\partial_{\mu}x^{\nu}\partial_{\nu}\mathbf{x}^{\mu}\right)^{3/2}}{\partial_{\mu}\partial_{\nu}x^{\mu}}\;\right]\mathbf{e}_{\mu} \; + \mathbf{F}_{(\mathbf{0})}$$

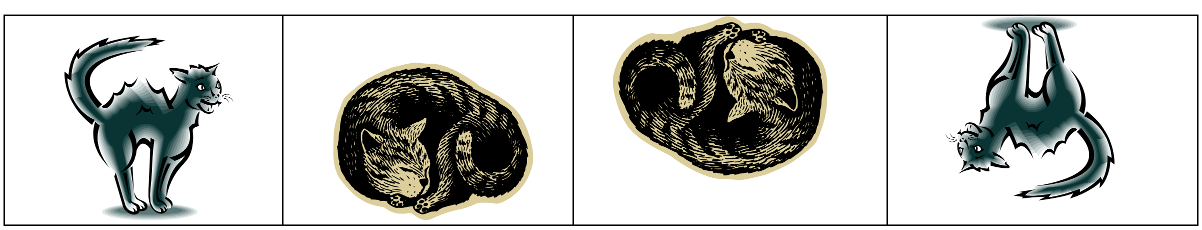
The first term is an interaction between body 1 and body 2 (and the Graviton-Graviton exchange), the second term shows the interaction between the universe and body 2 (and the Graviton-Graviton exchange). The constants in this scheme have the values with less extreme powers:

$\widetilde{\mathrm{H}} = \frac{\pi^2 \ G}{c^2}$ = 7.32745792x10^{-27} (m.Kg^{-1}) ≃ 7.33x10^{-27} (m.Kg^{-1})

$\widetilde{\mathrm{D}} = \frac{\boldsymbol{\pi^3} \ \langle\boldsymbol{\delta_0}\rangle\mathbf{G}}{\hbar.\mathbf{c}}$ = 7.055x10^{-8} (1/m^4.kg)   ≃ 0.71x10^{-7} (m^{-4}.Kg^{-1})

Remember that if a field contains the spin, then the field is quantized, since the spin is quantized; so, every spin is integer multiple of spin/2, for the graviton, which is considered the quantum of the gravitational field, the total magnitude of spin is ħ.√((s (s + 1)), that is, for the graviton that is an intermediate vector boson, has an intrinsic angular moment, characterized by the quantum number s = 2, the entire magnitude of the angular moment is 2.5 ħ, with two probabilities for the component z of the angular moment S_z = ± 2 ħ, the magnetic moment μ_s is zero since its charge is zero, they are impenetrable particles of matter; for Graviton which is a Fermion with spin s = 3/2, the total magnitude is ≃2. Since it is not a physical spin, but a manifestation of the spin, this leads to the introduction of an additional quantum number that in gravitation can have, in the case of Gravitino two possible values + 3/2, if gravity is between matter and -3/2 if gravity is between antimatter. This provides supersymmetry considerations.

The equation (2a) for gravity represents the state $(Ş_{\boldsymbol{G1}}, Ş_{\boldsymbol{T}})$ = (↓↑) and the (4a) equation for the force is the state $(Ş_{\boldsymbol{G1}}Ş_{\boldsymbol{G2}}, Ş_{\boldsymbol{T}}Ş_{\boldsymbol{G2}})$ = (↓↓,↑↓) this correspond to the Newtonian classic state, the equivalent of the universal gravitation law of the macro-world, however, we cannot ignore the rich heritage of quantum mechanics, since at the quantum level, there are other states for spin, therefore, for gravity acceleration or gravitational field we have a classic or more familiar state and three other accessible states, in total there are four basic states, although they can be more, for now we will show the basics: $(Ş_{\boldsymbol{G1}}, Ş_{\boldsymbol{T}})$ = (↓↑), (↓↓), (↑↑), (↑↓), colloquially they can learn with four Schrödinger cats: {Awake on the floor, asleep and glued to the floor (very tight down), asleep and glued to the ceiling (very tight up) and awake on the ceiling}:



And on the other hand, for the total force field there are 4x4 = 16 (ten and six) possible basic states:

$(\c{S}_{G1}\c{S}_{G2}\,,\c{S}_{T}\c{S}_{G2}) \implies$ (↓↓,↑↓), (↓↓,↑↑), (↓↓,↓↑), (↓↓,↓↓), (↑↓,↓↓)………(↑↑,↑↑)

Identical to the case of the Gravitational Field, it can be shown that the Gravitational Force Field is made zero when

$$\mathbf{R_c} = \sqrt[4]{\left(\frac{4\hbar}{3\pi c\lambda_1\langle\delta_0\rangle}\right)}$$

A similar range of scope should be verified in the flow expressions of the field **F** and $\boldsymbol{g}$, which gives mathematical strength to the model here posed.

Gravitational field flow

Well we know that to calculate the flow of a vector field, in general, we consider a surface S in a region where we have a vector field G, by dividing S into small dSi, we can plot the u_i versors perpendicular to the surface at one of its points.

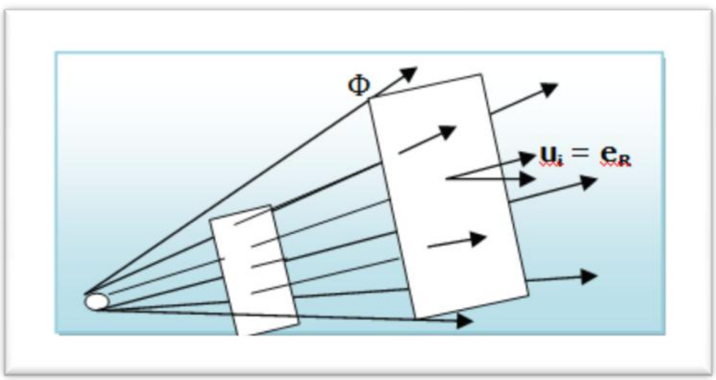


Illustration: The Flow Lines

In the symbolism of outer calculus, which allows generalization for a space of any number of dimensions the formulas of Gauss, Stokes, Ostrogradski of ordinary space, it can be shown, following a path that essentially consists in the generalization of the methods employed for the case of dimensions 2 and 3. If in an n-dimensional space you have A-dimensional variety of p-dimension, which is the outline of another variety ϑ of p +1 dimension and if ω is a differential form of p-order, defined in **Ş**, you have to:

$$\int_{\c{S}} \omega = \int_{\vartheta} d\omega$$

Where the second member of the integrand is the outer differential form of the form ω, which is applicable in our case for n=4 and p=3, we have space-time, that is, that the theorem is applicable to Minkowski space. For a body C_1 which we place at the center of a tetrasphere, let us calculate the expression of gravitational field flux through the 3-dimensional variety, which is the outline of that Hypersphere. The verse normal to the hypersurface, coincides with $\hat{e}_R$, unit vector that expands to the distance R, that is to say $\mathbf{u_n}=\mathbf{\hat{e}_R}$ according to the radial direction and the angle Θ between the versor and the field $\boldsymbol{g}$ is zero, moreover they are perpendicular to the hypersurface of dimension 3, such that cosΘ=1.

On the other hand $\boldsymbol{g}$ it has equal magnitude at all points of the hypersurface, Ş=2π2R3.sen2Θ which is the total area, which is zero in Θ=π, in the calculation of the flow, we will find

$$\mathbf{\Phi} = \oint_{S} \boldsymbol{g}.\,\mathbf{dŞ}$$

$$\mathbf{\Phi} = \boldsymbol{g} \oint_{Ş} \mathbf{dŞ}$$

$$\mathbf{\Phi} = \boldsymbol{g}.\,\mathbf{Ş}$$

$$\mathbf{\Phi} = \mathbf{0}$$

This result generates a law of conservation of energy for the whole four-dimensional universe, since if there is no flow there are no gravitation waves for the exterior of the Hypersphere at the global level, but if there is local flow in the interior of the universe; for this reason, Tetra-spheres can be defined associated with each physical body that exists within it. Consider our example where we have a physical body that generates field and interaction with the universe, this field has spherical surfaces with total surface area other than zero (in the language of models with dimensions greater than three, they are called Hyperplanes, when a dimension is subtracted from hyperspace), if the 4-Volumen has a radius defined as an R tetradistance going from the body to the hypersurface, this is equal to $\boldsymbol{V} = \frac{\pi^2}{2}\boldsymbol{R}^4$, therefore its Hyperplane or surface will be the derivative $Ş = \mathbf{2}\boldsymbol{\pi}^2\boldsymbol{R}^3$; replacing this in the equation, for the local gravitational flow calculation generated by the presence of a body and taking the magnitude of the field in the equation (1):

$$\mathbf{\Phi}_{\boldsymbol{g}} = \left(-\left[\frac{\mathbf{2\pi\hbar G}}{\mathbf{c}}\right]\frac{\mathbf{1}}{\boldsymbol{\lambda}_\mathbf{1}}.\frac{\mathbf{1}}{\mathbf{R^2}} + \left[\frac{\mathbf{3\pi^2}\,\langle\boldsymbol{\delta}_\mathbf{0}\rangle\mathbf{G}}{\mathbf{2}}\right]\mathbf{R^2} + \mathbf{G_0}\right).\,\mathbf{2\pi^2R^3}$$

$$\boldsymbol{\Phi_{g}} = -\left[\frac{4\pi^3\hbar G}{c}\right]\frac{R}{\lambda_1} + [3\pi^4 \langle\delta_0\rangle G].R^5 + \Phi_0 \qquad (5)$$

$$\Phi_{g} = -f_1\frac{R}{\lambda_1} + f_2.R^5 + \Phi_0$$

Where $\mathbf{f_1=2.91120x10^{-51}\ (m^4s^{-2})}$ is the accelerated change of volume in time or in another context with dimensions of $m^4.hz^2$ is a unit of quadrivolume per frequency squared and the second constant $\mathbf{f_2=1.96190231x10\text{-}^{32}\ (m^{-1}.s^{-2})}$ inverse units of the length by the square of the frequency, which contrasts and preserves the units of flow that are ($m^4.s^{-2}$), that is, accelerated variation of the 4-Volumen. In the last calculation use the 4-density mean mass value of the nearby universe[17], susceptible to corrections relating to energy, non-visible matter and other contributions:

$$\langle\delta_0\rangle = 1.01x10^{-24}\ Kg.m^{-4}$$

Quantitatively, the flow represents the number of field lines traversing the surface. On a closed surface, the flow that passes through it is mixed, in our negative and positive case

$$\Phi_{g} = -\Phi_{In} + \Phi_{Out} + \Phi_0$$

The Illustration of Inbound and Outbound Flow Lines is identical to the field lines shown above as sources and sinks.

Note that this flow is a function of tetradistance and is compound, has a negative contribution corresponding to a sink indicating lines of incoming gravitational flow and another positive part describing a source or lines of outgoing gravitational flow; as if the universe were pulling the bodies while the bodies are opposing that tension that the universe exerts, curiously the first constant f_1 with negative sign, is also talking about a 4-volume acceleration, as in the case of potential (Ec.1) that had positive sign. Φ_0 is the flow of the geometry field, Geonic Field flow.

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[17] The average density of the nearby environment could be that 〈δo〉 = δo, although with small differences that at the moment it is not necessary to detail, but according to the scale of magnitudes and spatial dimensions in which one works, these differences can be despicable. A good approximation for the vacuum is equal to a constant, whose value is close to $1.1 \pm 0.5x10^{-29}$ gr/cm^3, a more or less acceptable quantity in the range 10^{-27}-10^{-31} in the non-static universe solution of Friedmann (1922), see Ronald Adler, M. Bazin, M. Schiffer: introduction to General Relativity. On the other hand, in March 1998, the works of two independent groups appeared in the press (Science 1998, 279, 651-652 and 1298; Perlmutter et al. 1997, AG Kim 1998, Schmidt et al. 1998, Riess et al. 1998). Working in Supernova Ia. The results of both are consistent with a vacuum energy density $\rho_{vacuum} \sim 0.75\rho_{critical}$, this equates to a value of $6x10^{-30}$ g / cm3. For more details see publication: http://www.astronomia.net/cosmologia/lambda.htm

On the other hand, the flow of the Gravitational Field is not constant, but depends on the coordinates; disregarding the value of Φ_0, we can also observe that the flow becomes zero when:

$$\left[\frac{4\pi^3\hbar G}{c}\right]\frac{R}{\lambda_1} = 3\pi^4 \langle\delta_0\rangle N.R^5$$

So we get a critical radius for the flow with identical components that in the case of the gravitational field and the force field.

$$R_c = \sqrt[4]{\left(\frac{4\hbar}{3\pi c\lambda_1\langle\delta_0\rangle}\right)}$$

This result corresponds to a revision mechanism that guided me in the personal realization of the mathematical proof of the model, since in all calculations this radial limit is repeated. Inside R_c, the body C_1 attracts objects, outside R_c the universe pulls the body as an antigravity and in R_c the balance is given between the body C_1 and the universe U[4].

The flow of lines of gravitational force can be determined under the same criteria

$$\Phi_F = \left[-\left(\frac{4\pi^2\hbar^2 G}{c^2}\right)\left(\frac{1}{\lambda_1\,\lambda_2}\right)\frac{1}{R^2} + \left(\frac{3\pi^3\,\hbar G\langle\delta_0\rangle}{c}\right)\left(\frac{1}{\lambda_2}\right)R^2 + F_{(0)}\right].2\pi^2R^3$$

$$\Phi_F = -\left(\frac{8\pi^4\hbar^2 G}{c^2}\right)\frac{R}{\lambda_1\,\lambda_2} + \left(\frac{6\pi^5\,\hbar G\langle\delta_0\rangle}{c}\right)\frac{R^5}{\lambda_2} + \Phi_{(0)} \qquad (6)$$

$$\Phi_F = -2\pi^2 H.\frac{R}{\lambda_1\,\lambda_2} + 2\pi^2 D.\frac{R^5}{\lambda_2} + \Phi_{(0)}$$

Where:

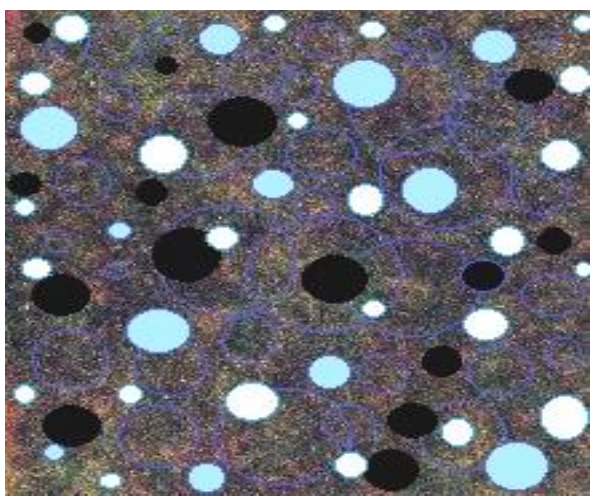
$\mathbf{2\pi^2 H = 6.44 \times 10^{-93}}$ $(Kg.m^5.s^{-2})$, It suggests “a quantity of matter per acceleration and per quadrivolume and in another context it is matter times squared frequency, and another constant:

$\mathbf{2\pi^2\,D = 6.51 \times 10^{-74}}(Kg.s^{-2})$**,** These constants always suggest that the universe on a small scale grows rapidly and that it is still vibrating, it must also make matter vibrate, there is here a dual conceptualization for these constants. On the other hand, these signs of an accelerating universe solve The Historic Olbers Paradox.[18]

Note that the critical limit is re-verified:

$$\mathbf{R}_{\mathbf{c}\Phi_F} = \sqrt[4]{\left(\frac{4\hbar}{3\pi c\lambda_1\langle\delta_0\rangle}\right)}$$

The gravitational force flow also has a critical radius similar to the previous calculation for the gravitational field flow so that the interaction limits of the bodies are set. Finally, the dimensions of the gravitational force flux are **($Kg.m^4.s^{-2}$)** is like a quantity of force advancing through each cubic meter of equipotential surface. Remember that for field flow $\boldsymbol{g}$ are **($m^4.s^{-2}$)** in $U^{(4)}$, these results are due to the choice of the number of dimensions of space. In the Newtonian case it is not **($m^4.s^{-2}$)** but **($m^3.s^{-2}$)** and the equipotential surface has dimensions of m^2.



Our universe $U^{(4)}$ is a grainy network, interwoven of relations between bodies and the basic or empty state.

The Divergence of the Gravitational Field

[18] **The paradox of Olbers or problem Olbers**, formulated by the German astronomer Heinrich Wilhelm Olbers in 1823 and earlier by Johannes Kepler in 1610 and Chéseaux in the eighteenth century, is the paradoxical statement that in a static infinite universe, the sky Night should be fully bright with no dark or lightless regions. I think that this paradox must be reformulated for the finite and unlimited Universe.

The divergence is a scalar product between the D'Alembert operator $\square$ and the tensorial function G. When applied to a vector field at a point the result is a scalar field, it is also mathematically defined as the flow of the vector field per unit volume, when the volume around the point tends to zero:

$$\mathbf{Div}\, \boldsymbol{g} = \square \,.\, \boldsymbol{g}$$

$$\mathrm{Div}\, \boldsymbol{g} \equiv \lim_{\Delta \mathrm{V} \to 0} \frac{1}{\Delta \mathrm{V}} \oint_{\text{Ş}} \vec{\boldsymbol{g}}_{(\mathrm{R})} . \, \mathrm{d}\vec{\text{Ş}}$$

Where Ş is a closed surface that reduces to a point on the limit. The symbol $\square$ Four-dimensional, plays the same role as the one performed by the nabla operator ∇ in three-dimensional Euclidean space.

This definition is directly related to the concept of field flow. As in the case of flow, if the divergence at a point is positive, the field is said to be a source, i.e. it has sources. If the divergence is negative, the field is said to be a sink, that is, to have sinks; if it is null at all points in the field, the field is solenoidal. The most characteristic example is given by electric charges, which give the divergence of the electric field, being the positive charges springs and negative sinks of the electric field.

Called scalar sources from the field G to the scalar field that is obtained from the divergence of the field G

$$\boldsymbol{\rho}_{(\vec{\mathbf{R}})} = \square \,.\, \boldsymbol{g}_{(\vec{\mathbf{R}})}$$

For divergence, we formally apply the inner product between the two quadrivectors $\boldsymbol{g}$ and $\square$, thus,

$$\begin{aligned} \boldsymbol{div}\, \boldsymbol{g} &= < \square | \boldsymbol{g}_{(\mathbf{R})} > \\ &= \mathbf{e}_{\mu} \frac{\partial}{x_{\mu}} \cdot \boldsymbol{g}^{\mathbf{v}} \mathbf{e}_{\mathbf{v}} \\ &= < \mathbf{e}_{\mu} | \mathbf{e}_{\mathbf{v}} > \frac{\partial \boldsymbol{g}^{\mathbf{v}}}{x_{\mu}} \\ &= \boldsymbol{\eta}_{\mu\mathbf{v}} \frac{\partial \boldsymbol{g}^{\mathbf{v}}}{x_{\mu}} \end{aligned}$$

It is easy to verify in calculating the divergence of the gravitational field that when applying the derivative to the Ec. (2) you get a non-zero scalar function of the shape

$$\Box \cdot \mathcal{g}_{(\mathbf{R})} = \left(\frac{2\boldsymbol{\alpha}}{\boldsymbol{\lambda}_1\mathbf{R}^4} + 6\boldsymbol{\beta}\right).(-\mathbf{x}^0 + \mathbf{x}^1 + \mathbf{x}^2 + \mathbf{x}^3)$$

This means that scalar sources also exist. Applying again the scalar operator over the previous result and considering the substitution of the values of the constants α and β of $\frac{1}{\lambda_1} = \frac{\pi c \delta R^4}{4\hbar}$, where **δ** the body density that generates the field, we see that R^4 is cancelled and finally obtained:

$$\Box . \Box \mathcal{g}_{(\mathbf{R})} = \left(\frac{2\boldsymbol{\alpha}}{\boldsymbol{\lambda}_1\mathbf{R}^4} + 6\boldsymbol{\beta}\right)\Box . (-\mathbf{x}^0 + \mathbf{x}^1 + \mathbf{x}^2 + \mathbf{x}^3)$$

$\Box^2 \mathcal{g}_{(\mathbf{R})} = \left(\frac{2\boldsymbol{\alpha}}{\boldsymbol{\lambda}_1\mathbf{R}^4} + 6\boldsymbol{\beta}\right).(-\mathbf{1} + \mathbf{3})$, and the values of α and β, as said, we get:

$\Box^2 \mathcal{g}_{(\mathbf{R})} = \mathbf{2\pi^2 G\, \delta} + \mathbf{6\pi^2 G} < \boldsymbol{\delta}_{\mathbf{o}} >$, ie,

$$\boxdot\, \mathcal{g}_{(\mathbf{R})} = \mathbf{2\pi^2 G\, \delta} + \mathbf{6\pi^2 G} < \boldsymbol{\delta}_{\mathbf{o}} >$$

It the gravitational wave equation. Since this is not zero, we say that the scalar field is not harmonic. Note that the Planck constant disappears, however it is present implicitly in the densities.

When the object is very dense the second term of the above equation, is not significant, then we can return and consider equivalence.

$$\boldsymbol{\delta} = \frac{\boldsymbol{\delta}_{\mathbf{E}}}{\mathbf{c}^2} = \mathbf{T}^{\mathbf{00}}$$

We see that the first component of the energy matter tensor, considering all its components, then the gravitational wave equation can be generalized.

$$\boxdot\, \mathcal{g}_{(\mathbf{R})} = \left(\frac{\mathbf{2\pi^2 G}}{\mathbf{c}^2}\right)\mathbf{T}$$

Valid for the Macro-world and that in components or explicitly is written

$$\frac{\boldsymbol{\partial}}{\boldsymbol{\partial}\mathbf{x}_{\boldsymbol{\mu}}}\frac{\boldsymbol{\partial}}{\boldsymbol{\partial}\mathbf{x}_{\boldsymbol{\nu}}}\mathcal{g}_{(\mathbf{R})} = \left(\frac{\mathbf{2\pi^2 G}}{\mathbf{c}^2}\right)\mathbf{T}^{\boldsymbol{\mu\nu}}$$

It is concluded that gravity spreads like a wave, so this model, is compatible with the predictions of TGR, There are gravitational waves and these gravitation waves propagate at the same finite velocity of electromagnetic waves, not instantaneously as the classic Newton model conceives. The verification of these waves will be carried out in detail and without a doubt in 2021, after the start of a space mission called LISA that is in the study phase to constitute the first gravitational wave space observatory and could be operating before or around 2020.

Rotational

We call rotational or rotor, the vector operator that transforms an R-dependent vector function into a geometric entity with the fundamental properties that characterize space. An alternate definition refers to the tensorial operator that shows the tendency of a tensorial field to induce rotation around a point.

Mathematically, this idea is expressed as the limit of the circulation of the vector field $\boldsymbol{g}$, when the curve on which it is integrated is reduced to one point:

$$\mathrm{R\breve{o}t}\, g \equiv \lim_{\Delta Ş \to 0} \frac{1}{\Delta Ş} \oint \vec{g}_{(\mathrm{R})}.\, \mathrm{d}\vec{\mathrm{R}}$$

Here, ΔŞ is the area of the surface supported on the C curve, which reduces to one point. The result of this limit is not the complete rotational (which is another vector), but only its component according to the normal direction to ΔŞ and oriented according to the right hand rule. To obtain the complete rotational three limits must be calculated in the three-dimensional case, considering three curves located in perpendicular planes.

Although the rotational of a field around a point is non-zero, it does not imply that the field lines revolve around that point and enclose it. A typical example is the velocity field of a fluid circulating through a pipe (called a Poiseville profile) which has a non-null rotational everywhere but on the central axis, although the current flows in a straight line.

The rotational of a tensorial function can be defined simply as the vector product (also called the outer product of multilineal forms) between the tensorial operator of D'Alembert and the tensorial function, with various notations:

$$\mathrm{R\breve{o}t}\, g = \square \wedge g$$

$$(\square \wedge \boldsymbol{g})_{\boldsymbol{\mu}} = \boldsymbol{\varepsilon_{\mu\nu\sigma}}\, \boldsymbol{\partial_{\nu}}\, \boldsymbol{g_{\sigma}}$$

Another determinant-based notation is

$$\square \wedge \boldsymbol{g} = \partial_\mu \boldsymbol{g}_\nu - \partial_\nu \boldsymbol{g}_\mu$$

Because the F tensors and $\boldsymbol{g}$ separable in components, it is easy to prove that the rotational of each of them is zero, since when applying the corresponding derivatives in pairs, they are annulled identically. As $\mathbf{R\breve{o}t}\,\boldsymbol{g} = \mathbf{0}$ and $\mathbf{R\breve{o}t}\,\mathbf{F} = \mathbf{0}$, then the field is said to be irrotational and the space $\mathbf{U}^{(4)}$ is related, with no gaps and its tensorial fields F and $\boldsymbol{g}$ are laminar and conservative. All this agrees with the definition of Conservative field: If a field derives from a potential through its gradient, considering that the rotational gradient is null, the rotational of any conservative field will also be null.

The Geons together constitute a minimal energy field which I have called the Geonic Field which is the basic state of the vacuum, this defines and conforms the geometry through which, particles like neutrinos on their journey could acquire mass, but on large paths because they do not interact electrically or magnetically with the void, they move very freely through it at the speed of light, they may acquire little mass because of the low energy of the basic state of the universe that has always been called void."

Relation of the model to the classical Newtonian limit and in conciliation with the definition of force within the framework of Einstein's spatial theory of relativity

Starting from the gravitational field equations F and $\boldsymbol{g}$, both field tensors of type $[^1{}_0]$, ecs. (2) and (4), we can operate on them in order to find the connection with Newton's model,

$$\boldsymbol{g}_{(\mathbf{R})} = -\left[\frac{2\pi\hbar G}{c}\right]\frac{1}{\lambda_1}\cdot\frac{1}{R^2}\,\hat{\mathbf{e}}_{\mathbf{R}} + \left[\frac{3\pi^2\,\langle\delta_0\rangle G}{2}\right]\mathbf{R}^2\,\hat{\mathbf{e}}_{\mathbf{R}} + \boldsymbol{g}_{(\mathbf{0})} \qquad (2)$$

$$\vec{\mathbf{F}}_{(\mathbf{R})} = -\left[\frac{2\pi\hbar G}{c\,\lambda_1}\right]\left[\frac{2\pi\hbar}{c\,\lambda_2}\right]\frac{1}{\mathbf{R}^2}\,\hat{\mathbf{e}}_{\mathbf{R}} + \left[\frac{3\pi^2\,\langle\delta_0\rangle G}{2}\right]\left[\frac{2\pi\hbar}{c\,\lambda_2}\right]\mathbf{R}^2\,\hat{\mathbf{e}}_{\mathbf{R}} + \mathbf{F}_{(\mathbf{0})} \qquad (4)$$

Let consider the expression for the 4-distance $\boldsymbol{R}^2 = \boldsymbol{c}^2\boldsymbol{t}^2 - \boldsymbol{r}^2$

On having replaced it in the above equations, omitting the terms $\boldsymbol{g}_{(0)}$ and $\mathbf{F}_{(0)}$ and multiplying in the respective numerators and denominators by the inverse of c^2t^2 and knowing further, that by definition of kinematics v = r/t, the equation is easily reached

$$\boldsymbol{g}_{(\mathbf{R})} = -\left[\frac{2\pi\hbar}{c\lambda_1}\right]\frac{G}{r^2\left(1-\frac{v^2}{c^2}\right)}\,\hat{\mathbf{e}}_{\mathbf{R}} + \left[\frac{3.\pi^2\,\langle\delta_0\rangle r^2}{2}\right]G\left(1-\frac{v^2}{c^2}\right)\hat{\mathbf{e}}_{\mathbf{R}} \qquad (2)$$

Substituting the duality equivalences for the mass M = 2πℏ / λ.c and multiplying by r / r, in the second term, we arrive at an expression identical to the Newtonian plus an additional factor

$$\mathbf{\bar{M} = 4\pi r^2} \times \langle \boldsymbol{\delta_0} \rangle$$

This can be interpreted as an average mass of the environment per unit area.

$$\boldsymbol{g}_{(\mathbf{R})} = -\frac{\mathbf{G.M}}{\mathbf{r^2}\left(\mathbf{1}-\frac{\mathbf{v^2}}{\mathbf{c^2}}\right)}\ \hat{\mathrm{e}}_{\mathbf{R}} + \frac{\mathbf{3\ G\bar{M}}}{\mathbf{8}}\left(\mathbf{1}-\frac{\mathbf{v^2}}{\mathbf{c^2}}\right)\ \hat{\mathrm{e}}_{\mathbf{R}} \qquad (\mathbf{2}')$$

A similar treatment for the force field, being M a particle traveling at velocity v and generating the Field and m a test particle in the vicinity at a 3-distance r, results in

$$\vec{\mathbf{F}}_{(\mathbf{R})} = -\frac{\mathbf{GmM}}{\mathbf{r^2}\left(\mathbf{1}-\frac{\mathbf{v^2}}{\mathbf{c^2}}\right)}\ \hat{\mathbf{e}}_{\mathbf{R}} + \frac{\mathbf{3Gm\bar{M}}}{\mathbf{8}}\left(\mathbf{1}-\frac{\mathbf{v^2}}{\mathbf{c^2}}\right)\ \hat{\mathbf{e}}_{\mathbf{R}} \qquad (4')$$

These are then the expressions for the macromund, these preserve the initial concepts of incoming and outgoing field lines; at the limit when v tends to zero, you have the Newton expressions (or at small speeds compared to that of light) and when the speed of light is reached, the second terms disappear and the first ones have a singularity, that is G and F tend to infinity, which seems compatible with masses moving at that speed and the definition of force in the Special Theory of Relativity. As a consequence it can be said that gravity is transmitted at a finite velocity, so the constant c is now the constant of the velocity of electromagnetic waves and gravitation waves, this reconciles the Newtonian model with relativity.

The gravitational action is at a distance for a particle in Newtonian theory, in General Relativity and in current unification theories gravitons do not possess mass because in them gravity has infinite scope, due to results obtained in this geometric model, this scope is finite or limited, since each body has a given domain at a critical distance R, thus, a set of particles behave as if they were isolated bubbles, the nearby ones interact with each other according to their range, remote ones do not interact due to their limited R range, but they are connected by the Geonic field and by the Gravitinos distributed in totality, for this reason the results obtained here differ from the current models on gravitation since in all of them gravitation continues to be considered as an interaction of infinite scope, we will find that the scope is constrained by the way the field equations are presented, in other words, it is a consequence of the functional form.

Attempt to unify the gravitational field with the electromagnetic field

In Maxwell's electromagnetic theory, Fµwell is the electromagnetic tensor that unifies magnetism and electricity and contains Maxwell's equations. Here the conditions are met: The first tensorial equation tells us that the gradient of F is equal to the quadrivector $\mathbf{J} = (\boldsymbol{\rho}, \vec{\mathbf{J}})$:

$$\nabla_{\mathrm{v}} \mathrm{F}^{\mu\mathrm{v}} = -\mu_0 \, \mathrm{J}^{\mu}$$

Once the potential quadrivector is defined, it is transformed as any quadrivector

$$A = (\phi, \vec{A})$$

This defines the covariant electromagnetic tensor:

$$\mathrm{F}_{\mu\mathrm{v}} = \partial_{\mu}\mathrm{A}_{\mathrm{v}} - \partial_{\mathrm{v}}\mathrm{A}_{\mu} = -\mathrm{F}_{\mathrm{v}\mu}$$

You can see that this tensor is antisymmetric, that is,

$$\mathrm{F}_{\mu\mathrm{v}} = -\mathrm{F}_{\mathrm{v}\mu}$$

$$F^{\mu\nu} = \begin{bmatrix} 0 & -E^1/c & -E^2/c & -E^3/c \\ E^1/c & 0 & -B^3 & B^2 \\ E^2/c & B^3 & 0 & -B^1 \\ E^3/c & -B^2 & B^1 & 0 \end{bmatrix}$$

It is possible to find the covariant electromagnetic tensorial field from the contravariant

$$\mathrm{F}_{\alpha\beta} = \mathrm{g}_{\alpha\gamma}\, \mathrm{F}^{\gamma\delta}\, \mathrm{g}_{\delta\beta}$$

The above equation is a tensorial equation in component notation that requires double summation over repeated indices. The computation can be facilitated if instead of the tensorial equation we use the corresponding matrix equation, to obtain:

$$\mathrm{F}_{\mu\mathrm{v}} = \begin{bmatrix} 0 & E_1/c & E_2/c & E_3/c \\ -E_1/c & 0 & -B_3 & B_2 \\ -E_2/c & B_3 & 0 & -B_1 \\ -E_3/c & -B_2 & B_1 & 0 \end{bmatrix}$$

So, we can multiply the first two matrices and multiply the resulting product by the third matrix, or we can multiply the last two matrices and multiply the resulting product by the first matrix, the result will be the same by virtue of the associative property of matrix multiplication.

To facilitate operation with components I will use c=1 in the E fields, to retake it at the end and recover the MKSA units. Multiplying the second matrix by the third matrix we get the following:

$$\begin{bmatrix} 0 & -E_1 & -E_2 & -E_3 \\ E_1 & 0 & -B_3 & B_2 \\ E_2 & B_3 & 0 & -B_1 \\ E_3 & -B_2 & B_1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 0 & E_1 & E_2 & E_3 \\ -E_1 & 0 & B_3 & -B_2 \\ -E_2 & -B_3 & 0 & B_1 \\ -E_3 & B_2 & -B_1 & 0 \end{bmatrix}$$

Then we pre-multiply this matrix by the first matrix to get the Faraday tensor components in their covariant tensorial representation:

$$\begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} 0 & E_1 & E_2 & E_3 \\ E_1 & 0 & B_3 & -B_2 \\ E_2 & -B_3 & 0 & B_1 \\ E_3 & B_2 & -B_1 & 0 \end{bmatrix} = \begin{bmatrix} 0 & E_1 & E_2 & E_3 \\ -E_1 & 0 & -B_3 & B_2 \\ -E_2 & B_3 & 0 & -B_1 \\ -E_3 & -B_2 & B_1 & 0 \end{bmatrix}$$

This is the Faraday tensor in its representation as a covariant tensor $F_{\mu\nu}$:

It is obvious that the elements of $F_{\alpha\beta}$ can be obtained from the elements of $F^{\alpha\beta}$ with the simple inversion of the signs of the components of E, i.e. replacing E with -E.

On the other hand, the Gravitational Field Matrix can be represented from the matrix product between the gravitational field matrix and the metric, for this purpose let us define the following operation:

$$\eta_\nu^\mu = \eta_{\mu\sigma} . \eta^{\nu\sigma}$$

Namely,

$$\eta_\nu^\mu = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

$$\eta_\nu^\mu = \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

In many models it is the product of inverse time operators T and Parity P. We can construct the new 4x4 matrix of gravitational field, which we can also call doubly contravariant field tensor of type $[^2{}_0]$:

$$G^{\mu\nu} = -[G^0 \quad G^1 \quad G^2 \quad G^3] . \begin{bmatrix} -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$$

$$G^{\mu\nu} = -\eta^{\mu}_{\nu} G^{\nu}$$

And we defined the matrix form of the gravitational field tensor G, with components $G^{\mu\nu}$, like this:

$$G^{\mu\nu} = \begin{bmatrix} G^0 & 0 & 0 & 0 \\ 0 & G^1 & 0 & 0 \\ 0 & 0 & G^2 & 0 \\ 0 & 0 & 0 & G^3 \end{bmatrix}$$

The unified tensorial field incorporating electromagnetism and gravitation over a Minkowskian differential variety can be obtained by the sum of the two fields represented by 4x4 matrices, in their simple form, U = F + G, which in components is:

$$\mathrm{U}^{\mu\nu} = \mathrm{F}^{\mu\nu} + \mathrm{G}^{\mu\nu}$$

Let us remember that $F^{\mu\nu}$ is the electromagnetic tensorial field. In matrix representation you can write multilineal shapes

$$U^{\mu\nu} = \begin{bmatrix} 0 & -E^1 & -E^2 & -E^3 \\ E^1 & 0 & -B^3 & B^2 \\ E^2 & B^3 & 0 & -B^1 \\ E^3 & -B^2 & B^1 & 0 \end{bmatrix} + \begin{bmatrix} G^0 & 0 & 0 & 0 \\ 0 & G^1 & 0 & 0 \\ 0 & 0 & G^2 & 0 \\ 0 & 0 & 0 & G^3 \end{bmatrix}$$

Namely,

$$\boldsymbol{U^{\mu\nu}} = \begin{bmatrix} \boldsymbol{G^0} & \boldsymbol{-E^1} & \boldsymbol{-E^2} & \boldsymbol{-E^3} \\ \boldsymbol{E^1} & \boldsymbol{G^1} & \boldsymbol{-B^3} & \boldsymbol{B^2} \\ \boldsymbol{E^2} & \boldsymbol{B^3} & \boldsymbol{G^2} & \boldsymbol{-B^1} \\ \boldsymbol{E^3} & \boldsymbol{-B^2} & \boldsymbol{B^1} & \boldsymbol{G^3} \end{bmatrix}$$

The electromagnetic-gravitational unified tensorial field U is obtained which is doubly contravariant of type $[^2{}_0]$, bone of order 2, preserving and preserving the functional conditions of each isolated model:

dU = dF = 0, for μ≠ν, in which the properties of electric and magnetic fields are verified:

$$d\mathrm{F} = (divB)dx^1 \wedge dx^2 \wedge dx^3 + \left(RotE + \frac{\partial B}{\partial x^0}\right) dx^2 \wedge dx^3 \wedge dx^0 + \left(RotE + \frac{\partial B}{\partial x^0}\right) dx^3 \wedge dx^1 \wedge dx^0 + \left(RotE + \frac{\partial B}{\partial x^0}\right) dx^1 \wedge dx^2 \wedge dx^0$$

$$d\mathrm{F} = 0 + 0 + 0 + 0$$

The gravitational potential ϕ leaves of the integration of U for the condition μ = ν, also it is fulfilled that: rot U=rot G=0, under the same condition μ = ν.

You can get the covariant tensorial field by using the operation

$$U_{\mu\nu} = \eta_{\mu\sigma} U^{\sigma\lambda} \eta_{\lambda\nu}$$

$$\boldsymbol{U_{\mu\nu}} = \begin{bmatrix} \boldsymbol{G^0} & \boldsymbol{E^1} & \boldsymbol{E^2} & \boldsymbol{E^3} \\ \boldsymbol{-E^1} & \boldsymbol{G^1} & \boldsymbol{-B^3} & \boldsymbol{B^2} \\ \boldsymbol{-E^2} & \boldsymbol{B^3} & \boldsymbol{G^2} & \boldsymbol{-B^1} \\ \boldsymbol{-E^3} & \boldsymbol{-B^2} & \boldsymbol{B^1} & \boldsymbol{G^3} \end{bmatrix}$$

Let's look at something about Lorentz invariance, let's look for the tensorial contraction Uμwell Uμz to conclude.

In accordance with the summation convention for repeated indices, by summing over, the first expansion yields the following result

$$U^{\mu\nu} U_{\mu\nu} = U^{1\nu} U_{1\nu} + U^{2\nu} U_{2\nu} + U^{3\nu} U_{3\nu} + U^{4\nu} U_{4\nu}$$

By carrying out the second expansion on, you get

$$U^{\mu\nu} U_{\mu\nu} = U^{11} U_{11} + U^{21} U_{21} + U^{31} U_{31} + U^{41} U_{4\nu}$$

$$+ U^{12} U_{12} + U^{22} U_{22} + U^{32} U_{32} + U^{42} U_{42}$$

$$+ U^{13} U_{13} + U^{23} U_{23} + U^{33} U_{33} + U^{43} U_{43}$$

$$+ U^{14} U_{14} + U^{24} U_{24} + U^{34} U_{34} + U^{44} U_{44}$$

Replacing the corresponding values and retrieving the MKSA units in the E = E/c^2 field yields:

$$U^{\mu\nu}U_{\mu\nu} = 2(B^2 - E^2/c^2) + G^2$$

Since both B^2 and E^2/c^2 and G^2 are scalars, it is concluded that the quantity $U^{\mu\nu}U_{\mu\nu}$ is a Lorentz invariant scalar. This result tells us that there are electromagnetic-gravitational waves, these could be detected in the future as a shock effect hypermassive neutron stars or black holes.

As an important note we can admit the presence of the components of the gravitational tensorial field within the 4x4 matrix because if we compare the intensity of the electromagnetic field with the gravitational field, in scale the latter is insignificant, in other words, when performing the classical calculation for a proton-electron pair within the hydrogen atom for a separation of $5.3\text{x}10^{-11}$ m, the electric force is of the order of $8.2\text{x}10^{-8}$ N, whereas the gravitational force barely gives $3.6\text{x}10^{-47}$ N, when comparing its values Fg/Fe = $4.4\text{x}10^{-40}$, it is almost zero, therefore, the definition with zeros on the diagonal is well suited in the initial Maxwellian definition for the microworld, however, it takes on significant large-scale values of matter-energy.

Identically other forces can be included, if these are expressed in terms of similar fields in their functional and matrix form, extending the dimensions of space and the unifying matrix. A greeting to all.

Table of Physical Constants Used

Name	Symbol	Value
Light speed	c	299 792 458 $m.s^{-1}$
Gravitational constant	G	6.67259 (85) $x10^{-11}$ $N.m^2Kg^{-2}$
Limited constant of Planck	ħ=h/2 π	1.054 572 66(63) $x10^{-34}$ J.s
Electrical permittivity of void	ε_o	8.854 187 817…$x10^{-12}$ $C^2N^{-1}m^{-2}$
Magnetic permeability of the gap	μ_o	4π x 10^{-7} $Wb.A^{-1}m^{-1}$
Thickness comes up of the nearby universe 3D	$\langle \delta_o \rangle_{(3)}$	$1.27x10^{-24}$ $Kg.m^{-3}$, Univ. Cerrado
Thickness comes up of the nearby universe 4D	$\langle \delta_o \rangle_{(4)}$	$1.078x10^{-24}$ $Kg.m^{-4}$, Univ. Cerrado.
Dimensional density conversion factor	$E^{(3)} \Rightarrow M^{(4)}$	0.8488263632=(8/3π)
Gravitational field constants	$\alpha = \left(\frac{2\pi\hbar G}{c}\right)$	$1.5x10^{-52}$ $(m^4.s^{-2})$
	$\beta = \left(\frac{\pi^2 \langle\delta_0\rangle G}{2}\right)$	$4.94x10^{-52}$ (s^{-2})
Constant electromagnetic-gravitational	$\left(\frac{\pi\ G}{c}\right)$	$7x10^{-19}$$(m.Kg^{-1}.s^{-1})$
Quantum - Gravitational constant (1)	$\left(\frac{\pi^2 \langle\delta_0\rangle G}{\hbar}\right)$	2π (hz.m-3.Kg-1)
		≡ 6.283563387 $(hz/m^3.kg)$
Quantum - Gravitational constant (2)	$\left(\frac{\pi^3 \langle\delta_0\rangle G}{\hbar.c}\right)$	$7.055x10^{-8}$ $(1/m^4.kg)$
Constant unifier of energy	$Н = \frac{4\pi^2\hbar^2 G}{c^2}$	3.25961 (52840) $x10^{-94}$ $(J.m^3)$
Constant cosmological frecuencial	$D = \frac{\pi^3\ \hbar\langle\delta_0\rangle G}{c}$	$7.322545159x10^{-76}$ $(J.m^{-2})$
		≡ $7.32x10^{-76}$ $(Kg.hz^2)$ … Is that all!

The fundamental constants are taken from the latest publication of Physics Today, August 1991, The Fundamental Physical Constants, By E. Richard Cohen and Barry N.Taylor.

Table of Volumes and surfaces for different dimensions:

Dimension	1	2	3	4	5	6	7	8	9	10
Volume	$2r$	πr^2	$\frac{4\pi r^3}{3}$	$\frac{\pi^2 r^4}{2}$	$\frac{8\pi^2 r^5}{15}$	$\frac{\pi^3 r^6}{6}$	$\frac{16\pi^3 r^7}{105}$	$\frac{\pi^4 r^8}{24}$	$\frac{32\pi^4 r^9}{945}$	$\frac{\pi^5 r^{10}}{120}$
Surface	2	$2\pi r$	$4\pi r^2$	$2\pi^2 r^3$	$\frac{8\pi^2 r^4}{3}$	$\pi^3 r^5$	$\frac{16\pi^3 r^6}{15}$	$\frac{\pi^4 r^7}{3}$	$\frac{32\pi^4 r^8}{105}$	$\frac{\pi^5 r^9}{12}$

Referencias de la tabla anterior:

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2. ↑ Weisstein, Eric W. «Esfera» (en inglés). *MathWorld*. Wolfram Research.

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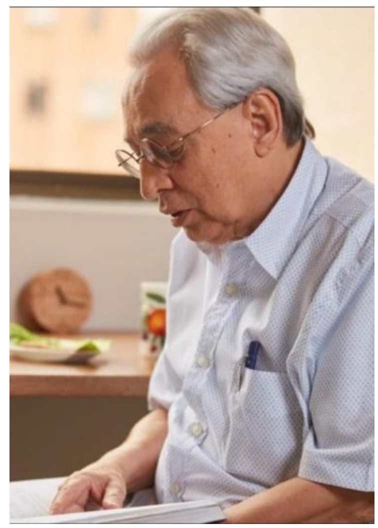
Thanks and Brief Review:

To the Physicists, professors of the University of Antioquia, who were my teachers and who devoted that part of their time in the review of this work, to them my most sincere appreciation. In another instance a very special thanks to the professor who made the second review since he finally determines if the work deserves a publication.

This work began to be elaborated from January 1988, was polished as the semesters would transcend during my physics studies, finally present it as my proposal for the degree thesis in 1995 and deliver two identical copies to the professors for their first revision.



First revision: February 1995, Professors Dr. PhD Regino Martínez Chavanz, Died in April 2021; Dr. PhD Alonso Sepúlveda, Died in February 2020 in Medellín, I dedicate this work to the memory of both esteemed teachers. Both suggested that I not present this work to qualify for the title of physicist in order to refine it, generalize it and thus be able to publish it later. Then present a second monograph type work entitled "The Theories of the Unified Field", where the proposals of A. Einstein, Weyl and Kaluza-Klein are simplifie; this work can be found in the Central Library of the University of Antioquia. After my graduation in 1995, the first work was shelved and in 2010 I made the decision to correct it thoroughly, this is the product of many years of work. My last personal checkup was on June 16, 2010, at 7:00 PM. Medellin, Antioquia.

Second review: was carried out by Professor Alonso Sepúlveda before his death in June 2019.

About the Author:

Martin Orlando Gil Cardona

Colombian physicist and painter with great interest in frontier physical theories such as Quantum Entanglement, Unified Field Theories, Cosmology and models of the Universe. For Martìn Gil, art and physics are intimately related through an interwoven network of mental and random relationships that are manufactured and self-rebuilt in each era, with its own characteristics highly influenced by the historical moment, its recipes sometimes clear at other times. intangibles, they show us scenes when we manage to float on the river of our own existence and capture only some of the relationships that the world offers us every day, while our brain tries to modify and create the missing pieces of that great puzzle. He is currently a professor at the Biophysics Laboratory at the University of Antioquia in Medellin Colombia.

Translated into English from the original document: TeoriaGeometricaDeLaGravedad_MartinGil