Chapter 10

Gravity, Curvature and Energy: Gravitational Field Intentionality to the Cohesion and Union of the Universe

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.71037

Abstract

We use the quantum operators O_c^G, which are diffeomorphisms of gravity creating the intentionality under the action integrals to prove and determine the gluing intention for adherence of the matter-energy (taking the corresponding mass-energy tensor T^{ab}) to create complex bodies in the scale of conforming the fragmented Universe such as we know. The reverse is the planting of the energy model of gravity in accordance with the implications in space-time due to the diffeomorphisms of gravity, which were designed to explain the existence of the intention as kernel of the integral operators of the actions with this intention as direction of the energy-matter. The time, in particular, can be shown through instantons of a gauge field (this as electromagnetic field, and in this case appears the torsion) of gravity, which appears in natural way as the same integral operators obtained. Finally, using the complex Riemannian structure of our model of the space-time, and the K-invariant G-structure of the orbits used to obtain curvature, are obtained as consequences of the diffeomorphisms, the field equations to the energy-matter tensor density in each case of the gravitational field.

Keywords: agglutination and gluing of sticking cells, curvature on quantum gravity, gravitational field intention, gravitational diffeomorphisms, integration invariants, local diffeomorphisms, regular representation

1. Introduction

The Universe outside their quantum model is a fragmented cosmos, where the matter is separated in different gradients of interaction of particles of fundamental level, which goes conforming scales of the matter until to shape the complex structures of all sidereal objects and the life that we know. However, in this process and for the alone presence of matter in the space is created a permanent will with persistent action and the long scope which is the gravitational field.

The permanence of this field is the control aspects of regulation in the sidereal objects such as the movements, shape of the objects, shape of the local space, auto-gravitation, and conformation of the chemical structures. Also their self-recomposing, as well as the different natural process to the life as the kinematic equilibrium of the living beings, biorhythm, biochemical auto-regulations, etcetera, which requires sedimentation and other process that brings the gravitational field, as example, the connection in equilibrium levels depending of the position between all bodies in the space. In addition, the time is a consequence possible of the gravitational field which has an effect, the curvature, where the time being the distance between cause and effect; the instantons [1] [1] of the curvature energy is the distance between gravitational field and curvature in layers of the matter-energy that goes composing the sidereal objects and the Universe. Likewise, this determines an integrated action with the intention of connect the space-time with gravity as the encoding of the Universe, at least in the Einstein-Cartan field conception considering also the Dirac equation to the energy level.

Likewise, we have:

Conjecture 1.1 (F. Bulnes). Gravity tends to join and agglutinate. Their intention is cohesion and shape of the Universe.

Why the gravity intention is the cohesion? Because, in the beginning of the Universe, the only ingredient was energy. After the Big Bang, the energy was being fragmented in matter and other energy manifestations in the Universe, such as we know in our days. The gravity is the ingredient of that primal energy (the energy before the Big Bang), but this is the version of that primal energy when matter in the space and time appeared (as well as local time or global time in the Universe).

Why the gravity intention is the shape? Because the Universe needs the gravity, to be used in the interpretations of elements of the Universe as are time, space, and energy. For example, space could be curvature, time could be second curvature (or torsion), and energy could be curvature energy in any of their modalities (first and second curvature energies).

2. Integrated action of gravity with the space-time

The Universe before their fragmentation (as has been interpreted in different cosmological theories in the beginning of the Universe) was conformed for energy due to the Big Bang. After when this was freeze gradually is conformed for a quantum process in an Early Universe composed in their totality by neutrinos as basic particles components. These neutrinos were differentiated for a natural process in new neutrinos giving some aspects of our Universe, as possibly the dark matter production. Other neutrino classes as the right-handed neutrinos were establishing with the baryon-genesis process; and other particles as the tachyons and

[1] An instanton, or also called pseudo-particle in particle physics, is in theoretical and mathematical physics, a classical solution to motion equations with a finite, non-null action as well as quantum mechanics or in quantum field theory. Likewise, this solution is a solution to the equations of motion in classical field theory on a Euclidean space-time.

http://dx.doi.org/10.5772/intechopen.71037

the fermions/anti-fermions in a polarization process creating the charge $Q[k]$, for one side, and for other side, with the mass particles that we know. Likewise, using theories that involve the spinor theories, massive objects in the Universe (modeled this as complex Riemannian manifold) can be detected and measured. This is given for the perturbation created in the space-time near of the presence of this object [2], when the gauge particle (in this case a photon) passes near the post-Newtonian gravitational limit of the event horizon of the object. The measure needs to be realized in the asymptotic region tending to the flat space far of the massive object; since the photon feels the gravity of the object in the condition of energy since as particle can do it.

To establish the concept of agglutination and join of matter, first it is necessary to analyze the matter on their equivalence, the energy. Before, the Universe was only energy that was available, including the space and time. There was no space and time as we know. These were born after the Big Bang, when the quantum proliferation of particles begun, which conformed the matter particles, these atoms and after molecules. But, what determines this way to create matter. This requires an implicit conscience to create matter from microscopic level, and as this primal matter was part of an energy flow that defines space-time, the rest was stayed as matter energy but without the qualities of compactification of the mass. This gives the beginning to the gravitational energy, which is as natural as the manifestation of a field, the gravitational field.

But, what happens with the space and time? How the gravity enters in the shape of the space and the time? Is gravity consequence of the intention of field in the Early Universe to control the inflation and of this way, to get a defined expansion with a causality-defined arrow?

The torsion of the space is related with the electromagnetic phenomena of the space-time, and gravity more torsion can to define helicities, spins, and polarization rules between particles in the fundamental context of the matter, movement, and space.

Such seems that the intentionality of the field in all the ages of the Universe has been maintaining the cohesion of the space-time such that the primordial component of field, which could be their connection will not be broken and the evolution obeys a sequence of microscopic model (Dirac model) of the Universe, where particles as neutrinos are re-combined. The Lagrangian model must involve the individual actions of gravity and torsion and their joint action,

$$L = \mathrm{L}_G + L_T + L_{\mathrm{GT}}, \tag{1}$$

then the action involving the integral term of gravity and torsion is [3]:

$$\begin{aligned} \mathfrak{F}_{\mathrm{TOTAL}} &= \frac{\mathrm{i}}{2\kappa}\int \mathrm{d}^4x\mathrm{e}\mathrm{e}_{\mathrm{a}}^{\mu}\mathrm{e}_{\mathrm{b}}^{\nu}\mathrm{R}_{\mu\nu}^{\mathrm{ab}}(\varpi)+ \\ &\frac{\mathrm{i}}{2}\int \mathrm{d}^4x\mathrm{e}\left(\mathrm{e}_{\mathrm{a}}^{\mu}\overline{\psi}\tilde{\gamma}^{\mathrm{a}}\mathcal{D}_{\mu}\varpi,\mathrm{A})\psi - \overline{\mathcal{D}_{\mu}(\varpi,\mathrm{A})\psi}\tilde{\gamma}^{\mathrm{a}}\psi)\right) + \frac{\mathrm{i}}{2}\int \mathrm{d}^4x\mathrm{e}\frac{3}{16}\ \kappa\mathrm{J}_{(\mathrm{A})}^{\mu}\mathrm{J}_{(\mathrm{A}\mu)}, \end{aligned} \tag{2}$$

where $\kappa = 8\pi G_N$, is the gravitational constant that appears in gravitation and $\kappa J_{(A)}^{\mu} J_{(A)\mu}$, is the fermion self-interaction induced by quantum torsion.

The neutrinos and anti-neutrinos, as was mentioned before, are relevant and primordial in the production of matter to obtain gravity. The role of torsion is to explain the mechanisms of matter/anti-matter in gravity.

To establish a Dirac model that gives explanation from the neutrinos and fermions (which establish the energy required to the coupling of torsion and gravity), the joint action between gravity and torsion comes through given torsion connections in the form:

$$\omega_{\mu}^{ab} = \varpi_{\mu}^{ab} + \frac{\kappa}{4} \in_{cd}^{ab} e_{\mu}^{c} J_{(A)}^{\mu}, \tag{3}$$

However, there exist some ambiguities in the Einstein-Cartan theory with the Immirzi parameter. For example, actions can be modified by total derivatives, without effects to on-shell physics given to create movement (that is to say, equations of motion), but such terms confirm the structural coefficients to the quantum context. For other side, in pure gravity without torsion, one can add the following identically zero term due to Bianchi identities of symmetry properties of the Riemann tensor:

$$\in^{\mu\nu\rho\sigma} R_{\mu\nu\sigma\rho}(\varpi) = 0, \tag{4}$$

which confirm that the gravity establishes a global behavior in the Universe, not being true in the presence of torsion to the quantum level. For example, the action

$$S_{Holst} = -\frac{\beta}{4\kappa} \int d^4x e e_a^{\mu} e_b^{\mu} \in_{cd}^{ab} R_{\mu\nu}^{cd}, \tag{5}$$

where the tensor $\tilde{R}_{\mu\nu}^{ab} = \in_{cd}^{ab} R_{\mu\nu}^{cd}$, is the dual of the curvature tensor $R_{\mu\nu}^{cd}$, which is nontrivial in torsionful geometries, but conformal with certain homogeneity degree, doing the gravity persist even in the post-Newtonian limit when the torsion let of act, because begins exist the vacuum of the Universe.

But in the torsion case, the movement equations imply:

$$T^{\mu} = \frac{3\kappa}{4} \frac{\beta}{\beta^2 + 1} J_{(A)}^{\mu}, \tag{6}$$

$$S^{\mu} = \frac{3\kappa}{\beta^2 + 1} J_{(A)}^{\mu}, \tag{7}$$

$$q_{\mu\nu\rho} = 0, \tag{8}$$

where is clear an inconsistent due to the equality between a vector T^{μ}, with the pseudo-vector $J_{(A)}^{\mu}$. Then we conclude that gravity acts and gives shape and cohesion to the space-time after certain step, when the current term $\frac{\kappa}{4} \in_{cd}^{ab} e_{\mu}^{c} J_{(A)}^{\mu}$, is added (see **Figure 1**). The Immirzi parameter only is the structural parameter to solve the inconsistent in the equation systems (6)–(8), but no symmetry.

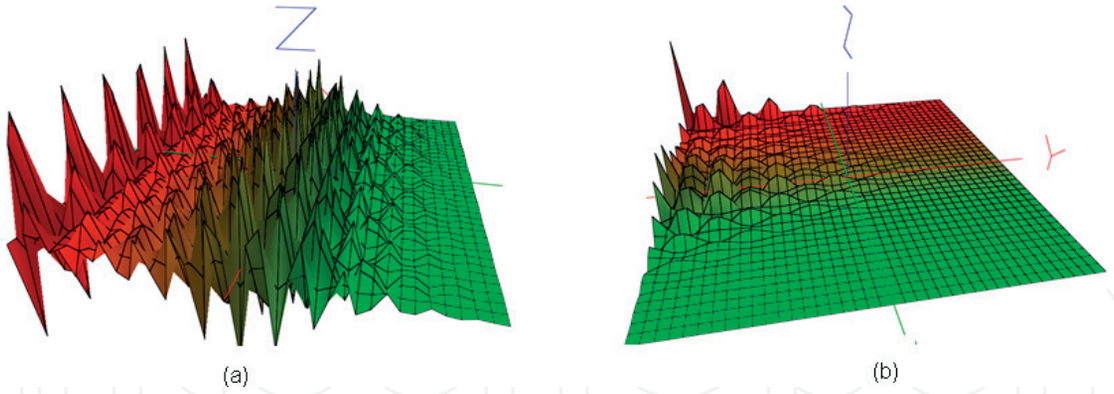

Figure 1. (a) Model of space-time with matter production without Immirzi parameter, but yes torsion. (b) Model of space-time with gravity and Immirzi parameter, including torsion. Observe the non-symmetric space created in the waving movement due to gravity.

The Holst term needs modification by the addition of fermions to become total derivative [3, 4], and provokes the coupling with the gravity to a global action on the space-time.

The fermion-piece that will be added to the Holst action is:

$$S_{\text{Holst-Fermion}} = \frac{\alpha}{2}\int d^4xe \times \left(\overline{\psi}\gamma^{\mu}\gamma_5\mathcal{D}_{\mu}(\omega)\psi + \overline{\mathcal{D}_{\mu}(\omega)}\gamma^{\mu}\gamma_5\psi\right), \alpha = \text{cont}, \tag{9}$$

together with Dirac kinetic term, the fermion action reads:

$$S_{\text{Dirac-Holst-Fermion}} = \frac{i}{2}\int d^4xe \times \left(\overline{\psi}\gamma^{\mu}\left(1 - i\alpha\gamma_5\right)\mathcal{D}_{\mu}(\omega)\psi + \overline{\mathcal{D}_{\mu}(\omega)}\gamma^{\mu}\left(1 - i\alpha\gamma_5\psi\right)\right), \tag{10}$$

If $\alpha = \beta$, the *Holst total gravity-fermion* term becomes total derivative, that is to say:

$$S_{\text{Holst}-\text{total}} = -\frac{\beta}{2}\int d^4x\left[I_{\text{NY}} + \partial_{\mu}J^{\mu}_{(A)}\right], \tag{11}$$

which establish an equivalent to the Einstein-Cartan theory independent of Immirzi parameter β.

In Eq. (11), I_{NY} is the *Nieh-Yan topological invariant density* which creates the unique Lorentz invariant torsion structure, which has the form:

$$I_{\text{NY}} \equiv e^{\mu\nu\rho\sigma}\left(T^{a}_{\mu\nu}T_{\rho\sigma a} - \frac{1}{2}e^{a}_{\mu}e^{b}_{\nu}R_{\rho\sigma ab}(\omega)\right), \tag{12}$$

which in simplified shape is written as

$$I_{\text{NY}} \equiv e^{\mu\nu\rho\sigma}\partial_{\mu}T_{\mu\nu\sigma}, \tag{13}$$

Then our model of cohesion by gravity is possible, since the scattering in the space-time is decreased under the last action (see **Figure 1(a)**).

3. Diffeomorphisms in gravity

Likewise, to energy level, let E be the energy, S be the space, and T be the time, and the corresponding topological spaces be U_S^E and U_T^E [5] such that the following commutativity of the diagram is satisfied:

$$\begin{array}{ccc} \mathrm{T} & \xrightarrow{\xi} & \mathrm{S} \\ \mathrm{f}\downarrow & & \downarrow g, \\ \mathrm{E} & \xrightarrow{\mathrm{Id}} & \mathrm{E} \end{array} \tag{14}$$

where in the context of the energy-(space-)time, an application ξ is an Universe homomorphism:

$$U_T^S = U_S^E U_T^E, \tag{15}$$

considering that $\mathrm{f}: \mathrm{T} \to \mathrm{E}$ is a smooth mapping between manifolds (the composition $\xi \circ \psi$), and let U_T^E be the image of the universal covering established for the commutative diagram. Then the image U_T^E is a manifold of E (the space of energy). We say that f is transversal to U_T^E, which can be denoted as $f \cap U_T^E$, if and only if, to each $x \in f^{-1}\left(U_T^E\right)$, is had that:

$$\mathrm{Im}(\mathrm{df}_x) + \mathrm{T}_{f(x)} U_T^E = \mathrm{T}_{f(x)}\mathrm{E}, \tag{16}$$

and analogy to the space S had a smooth mapping between manifolds S and E such as $\mathrm{g}: \mathrm{S} \to \mathrm{E}$, where the image U_S^E is a submanifold of the space E. Then is had $g \cap U_S^E$, if and only if to $y = \mathrm{g}^{-1}\left(U_S^E\right)$, is had that:

$$\mathrm{Im}\left(\mathrm{dg}_y\right) + \mathrm{T}_{g(y)} U_S^E = \mathrm{T}_{g(y)}\mathrm{E}, \tag{17}$$

Def. 3.1. Given that $\mathrm{f}: \mathrm{T} \to \mathrm{E}$, and $\mathrm{g}: \mathrm{S} \to \mathrm{E}$, the applications of f, and g, are transversals (that is to say $f \cap g$) and if $\forall \mathrm{x} \in \mathrm{T}$, and $y \in \mathrm{S}$, satisfy $f(x) = \mathrm{g}(y) =: \mathrm{z}$, then is had that:

$$\mathrm{Im}(\mathrm{df}_x) + \mathrm{Im}\left(\mathrm{dg}_y\right) = \mathrm{T}_z\mathrm{E}, \tag{18}$$

Then a diffeomorphism between the space $T_{g(y)}\mathrm{E}$ and $\mathrm{T}_{f(x)}\mathrm{E}$, can be established, where f and g are differentiable (for their definition as mapping). By transversality, we have the following mapping [6]:

$$\mathrm{T}_{f(x)} E \to T_{g(y)}\mathrm{E}, \tag{19}$$

that establishes the variation of the energy-(space-)time states in the covering space E [4]. Their differential is the curvature. Their integral is the variation principle $\delta(\int Diff\, f)$.

But how the energy states vary in this broth of space-(energy-)time given by the Universe U_T^S, of such lucky that the matter can be formed with the step of time. Here, the time happens as

http://dx.doi.org/10.5772/intechopen.71037

distance between cause and effect or distance between initial state and final state of a waving in the space.

Let X, be a field acting in the space-time as energy that involves space and time [7]. An oriented string τ, in this space U_S^T, can be defined from a $\varphi_0 \in \mathrm{E}$, until a $\varphi_\alpha \in \mathrm{E}$, as a continuous function $X : [\varphi_0, \varphi_\alpha] \to U_S^T$, such that $X(\varphi_0) = \varphi_0$, and $X(\varphi_\alpha) = \varphi_\alpha$, in certain evolution step α [2].

Def. 3.2. We consider the Lagrangian $L(\varphi, \dot{\varphi})$, for the energy state $\varphi \in E^3$. Then, we define the perception or field conscience operator O_C, as the mapping [8]

$$\mathrm{O}_C : \mathrm{TE} \to \mathrm{TE}^*, \tag{20}$$

with the correspondence rule[4]

$$\varphi \mapsto \mathrm{O_c}(\varphi), \tag{21}$$

which is translated in the differential

$$\mathrm{d}\mathfrak{F}(\varphi)\mathrm{h} = \int_\Gamma \left(\frac{\partial \mathrm{L}}{\partial \varphi} - \frac{\mathrm{d}}{\mathrm{dt}}\frac{\partial \mathrm{L}}{\partial \dot{\varphi}}\right)\left(\varphi(\omega(\mathrm{s})), \dot{\varphi}(\omega(\mathrm{s}))\mathrm{h}(\omega(\mathrm{s}))\mathrm{d}\omega.\right. \tag{22}$$

We observe that the diffeomorphism given in Eq. (22) is the field conscience operator (20) with topological definition in Eq. (6).

The diffeomorphism O_C is of gravity if their connection [5, 7, 9, 10] of gravitational field $h(x)$, (considering the restriction condition given in Eq. (4)) is[5]:

$$(h(x)) - \frac{1}{2}g(x)h)x(s) = \eth(x(s)), \tag{23}$$

Then, the gravity conscience satisfies the identity by (20)–(22) as[6]:

$$\int_H \left(T(\varphi)h(\varphi) - L\left(\varphi, \dot{\varphi}\right)\right)d\varphi = \int_\Omega \left(\left(h(x) - \frac{1}{2}g(x)h\right)\right)x(s)d(x(s)), \tag{24}$$

where we have used the property of O_C, given in [8]:

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[2] Remember that in QFT, field and wave can be the same using the two-duality principles: field and particles are the same and also wave and particle. Then by equality transitivity, field and wave are the same. Likewise, in string theory a string is a field.

[3] φ is an energy state of a field X.

[4] φ, X. $O_\mathrm{c}(\varphi) = \mathrm{d}\mathfrak{F}(\varphi) = L\left(\mathrm{s}, \varphi, \dot{\varphi}\right)\mathrm{d}\varphi$.

[5] The appearing of a vector $v(x)$, is when we derive again the expression (23). Then we obtain a vector as appears in the integrant of the integral expression given in Eq. (22).

[6] The integral in the right member is realized over the space $\Omega . \subseteq \mathbb{R}^3 \times \mathrm{I_s}$.

$$\int_{H} O_C(\varphi(x))d\varphi = \int_{\Omega} \mathcal{O}\left(\mathrm{x} - \mathrm{x}^{'}\right)x(s)d(x(s)), \tag{25}$$

where $\mathcal{H}$ is the energy states space defined explicitly[7]:

$$\mathcal{H} = \{\varphi(x) \in [m] | [m] \subset \mathrm{TE}^{*}\}, \quad [m] = \mathrm{T}*\mathrm{C}_{\mathrm{n,m}}, \tag{26}$$

The operator $\mathcal{O}(\mathrm{x}\text{-}\mathrm{x}^{'})$, derives from the study of functional derivative in quantum mechanics [8, 11]. $T(X)$ is the energy-matter tensor due to the source of matter production.

Expression (24) proves the Conjecture 1.1, given in Section 1, since this demonstrates that the field is a matter-production source (the particle process does appear 2-spin particles expressed inside the energy integral) that is to say, the gravity is the performance of the space-time, and O_C, induces a curvature tensor due the gravitational energy perceived for this by this performance.

Def. 3.3. The space-time performance is their gravity intention in certain evolution step.

Likewise, the gravity intention $\mathfrak{I}_{O_c}$ is to link the objects through a connection or shape operator of the gravitational field having the perception of matter given for the operator O_C,[8] (that is to say, for the only presence of the matter).

Finally, we can affirm considering the Dirac field equation and coordinates systems given for μ, ν, and λ that the diffeomorphism of gravity takes the invariant form:

$$\partial^{\lambda} G_{\mu\nu\lambda}(x) - \partial_{\nu} G^{\lambda}_{\mu\lambda}(x) + \mathrm{m}^2\left(\varphi_{\mu\nu}(x) + \frac{1}{2}g_{\mu\nu}\varphi(x)\right) = T_{\mu\nu} - \frac{1}{2}g_{\mu\nu}T(x), \tag{27}$$

Here is where appears the expression of difference of the energy-matter tensor to the equation of field (23), to the curvature tensor $R^{\mu\nu}$. Likewise, if the gravitational field persists as consequence of quantum interaction field in the Universe, then 0-spin particles and ½-spin particles must be transformed into 2-spin particles [12]. The conjecture 1.1 is totally demonstrated.

In [13], it was concluded that the torsion field stays univocally determined through $H-$ fields considering the established ranges (to matter and inflation [12, 13]). Also, the Dark matter begins their action on the fermionic dispersion to produce gravity annulling the chirality of the neutrinos/anti-neutrinos interaction and becoming these in oscillations of gravitons or "gravitational waves" registered and measured through spinor frames of the Majorana states.

Then this treatment to obtain a detailed description through microscopic context in field theory of the gravity (as matter-energy that is produced in the nucleon-synthesis, where is originated the matter and with it the fragmented Universe) is known with precision.

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[7] Also we can to define this space considering the images to n- particles in m- systems (always with $n \leq m$) in $\mathrm{T} * \mathrm{C}_{\mathrm{n,m}}$ as: $\mathcal{H} = \{\phi(\mathrm{x}) | \mathrm{H}(\phi(\mathrm{x})) = \frac{1}{2\mathrm{m}} \|\phi\|^2 + \mathrm{V}((\phi(\mathrm{x}))\}$.

[8] Conscience of the presence of matter. This conscience is the only presence of matter that does to change the spin of energy of the space between material bodies. Remember, the energy change and provokes movement.

But, these material products (such as planets, stars, galaxies, nebulas, etc.) are followed and joined by wave-links of gravity which conform their orbits and relative positions in the Universe.

We could say that the dark matter is the result of energy-matter with hadrons in action.

4. Observational confirmations and conclusions

As was mentioned in the beginning of this chapter, the inflation is normed by the matter production and for the existence of inflatons (condensation of gravitinos, which come of the interactions in the leptogenesis (**Figure 2**)). This determines the first inflation in the double inflation determined in the conformal SUGRA model which corresponds to our string model τ of the space-(energy-)time given for our topological space U_T^S in TFT. Then the second inflation happens in the Starobinsky inflationary phase ($\Lambda \neq 0$) [15] due to massive gravitino quantum fluctuations (induced by the higher curvature terms in 1-loop effective action). In this phase, the baryon-genesis ready to produce 2-spin particles happens, that is to say, gravity. This is the phase where the shape of the Universe with curvature has place. The cohesion is realized from the conformal SUGRA model (see the Planck + WP + BAO area **Figure 3** [9, 13, 14]). The second inflation happens as consequence of the quantum fluctuation in the 2-spin particles waving [13]. The operator $O(x - x')$, through their functional derivative that defines, create the diffeomorphism defined by O_C, whose derivative is their Lagrangian. The integral given in Eq. (25) establishes the Huygens principle on second dynamics law in terms of energy, because for one side of Eq. (25), we have gravitational energy and, in the second member, we have a force of gravitational field called by Huygens in the century XVII as "live force" of the Universe.

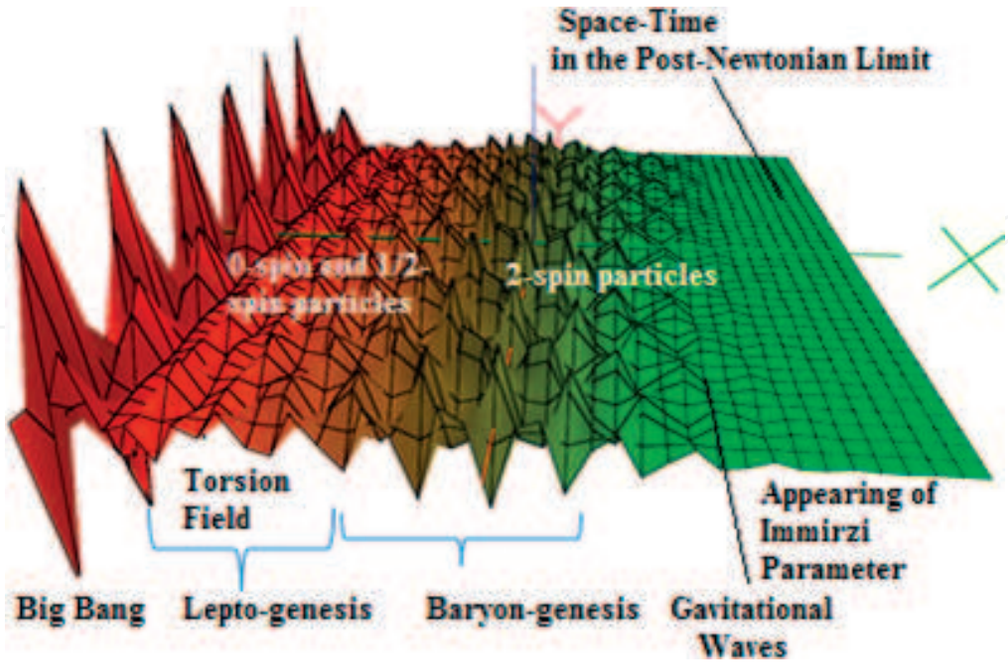

Figure 2. Evolution of the Universe and gravitational sequence of the energy-matter tensor [9, 12–14].

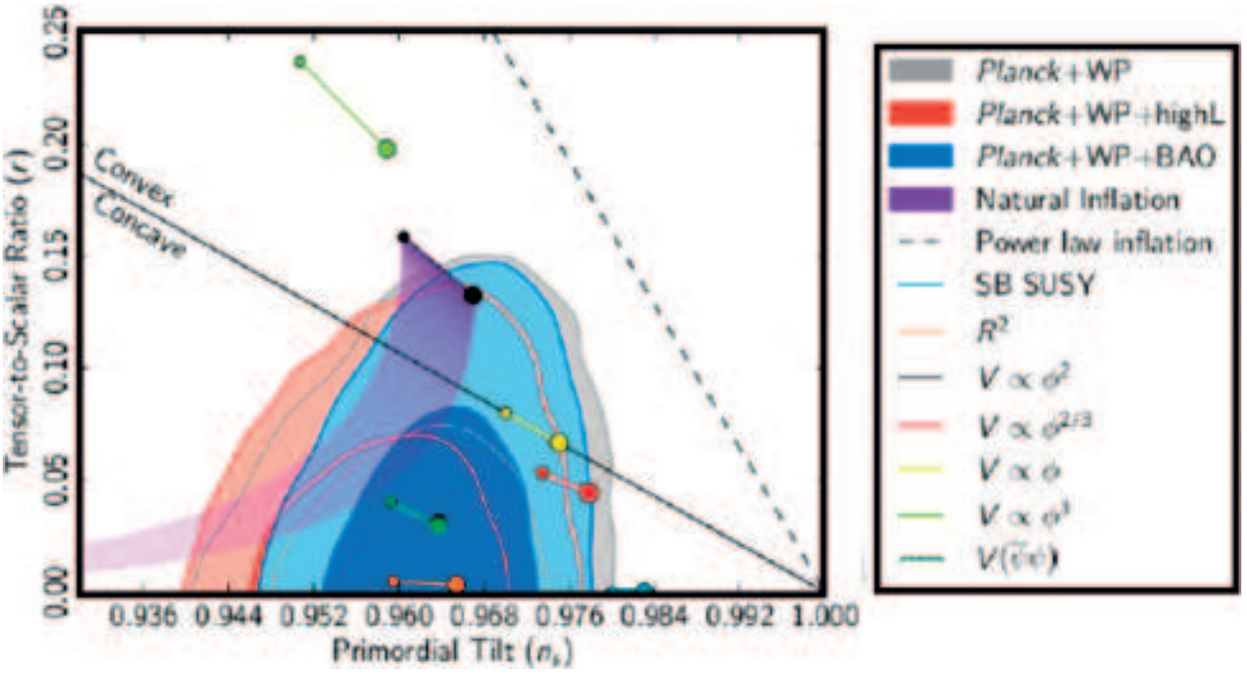

Figure 3. Energy-matter tensor development in the lepto-genesis and baryon-genesis processes. The SB SUSY region or area is where takes form the space U_T^S. the convexity in the thermal and expansion arrow meets to the causal structure of the universe defined by the light cones and given by the homomorphism (15).

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References

[1] Bulnes F. In: Pahlavani MR, editor. Correction, Alignment, Restoration And Re-Composition of Quantum Mechanical Fields of Particles by Path Integrals and Their Applications, Theo- retical Concepts of Quantum Mechanics. Janeza, Croatia: InTech; 2012. DOI: 10.5772/32847 Available from: https://www.intechopen.com/books/theoretical-concepts-of-quantum-mechanics/correction-alignment-restoration-and-re-composition-of-fields-of-particles-by-path-integrals-and-the

[2] Stropovsvky Y. Local diffeomorphisms and smooth embeddings to complex integral geometry, Chapter 2. In: Bulnes F, editor. Post-Doctoral Seminar on Curvature. EAE; 2017

[3] Bulnes F. Detection and measurement of quantum gravity by a curvature energy sensor: H-states of curvature energy, Chapter 7. In: Uzunov DI, editor. Recent Studies in Perturbation Theory. Intech; 2017

[4] Corradini O, Koyama K, Tasinato G. Induced gravity on intersecting brane worlds: Maximally symmetric solutions. Physical Review D. 2008;**77**:084006

[5] Bulnes F. Integral Geometry Methods in the Geometrical Langlands Program. USA: SCIRP; 2016

[6] Ramírez MA, Verkelov I. Transversality, deforming and curvature of space-time through axions, Chapter 4. In: Bulnes F, editor. Post-Doctoral Seminar on Curvature. EAE; 2017

[7] Francisco Bulnes, Topological Quantum Diffeomorphisms in the Field Theory and the Spectrum of the Space-Time, Proceedings of ICATMP 2017: 19th International Conference on Advances in Theoretical and Mathematical Physics. United Kindom; May 2017 urn: DOI:10.1999/1307-6892/10006924

[8] Bulnes F. Quantum intentionality and determination of realities in the space-time through path integrals and their integral transforms. In: Bracken P, editor. Advances in Quantum Mechanics. InTech; 2013. DOI: 10.5772/53439 Available from: https://www.intechopen.com/books/advances-in-quantum-mechanics/quantum-intentionality-and-determination-25 of-realities-in-the-space-time-through-path-integrals-and-t

[9] Mielke EW. Einsteinian gravity from BRST quantization of a topological action. Physical Review D. 2008;**77**:084020

[10] Ramírez M, Ramírez L, Ramírez O, Bulnes F. Coverings and axions: Topological characterizing of the energy coverings in space-time. Pure and Applied Mathematics Journal. Special Issue. 2014;**3**(6–2):6-11. DOI: 10.11648/j.pamj.s.2014030602.12

[11] Schwinger J. Particles, Sources, and Fields. In: Advanced Book Program. Vol 1. USA: Perseus Books; 1998

[12] Guivenchy E. Torsion Matter and their Corresponding Dirac Equations on Neutrinos and Matter/anti-Matter Asymmetries (Part I: scattering difference between Neutrinos/anti-Neutrinos), Journal on Photonics and Spíntronics, 2014;**3**(4):9-18

[13] Gorbuix S, Guivenchy E. Torsion matter and their corresponding Dirac equations on neutrinos and matter/anti-matter asymmetries (Part II: Gravitation insights). Journal on Photonics and Spintronics;**4**(2):15-25

[14] Shaposhnikov ME, Farrar GR. Baryon asymmetry of the universe in the minimal standard model. Physical Review Letters. 1993;**70**(19):2833-2836

[15] Kahya EO, Woodard RP. Scalar field equations from quantum gravity during inflation. Physical Review D;**77**:084012

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