

**Universe: the dynamics resulting from its maximum states of
contraction and expansion
(Cosmology from Vanishing Dimensions)**

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Abstract

The evolution of the Universe is observable when the expansive motion already exists; thus, the definition of universal states (before the beginning and after the end of the expansion) with zero kinetic energy can be a challenge to be solved by parallel analysis. Considering that a complete description of the Universe can provide important insights, the logic of conceptual connections is used as an alternative; in this sense, an exclusive presence of a linear Space (1D) in momentary states of maximum contraction and expansion is analyzed, with our Universe (3D Space) considered as created and existing between these extremes. The concept of rest mass energy became applicable, revealing that the complete evolution of the Universe is spatially dynamic in a permanent time dimension.

Keywords: Universe, Dimension, Entropy, Energy, Existence.

I. Introduction

The beginning of the current expansion of the Universe is a topic of great interest in cosmology. There are several ideas and theories that try to explain what may have initiated or preceded this expansion.

Among the (untested) theories guiding new research into the possible cause of the expansion of the Universe, emerge:

- String theory or the hint of a beginning through the interaction of branes [1] [2].
- An initial expansion due to a random quantum fluctuation or quantum instability [3].
- The Interaction of Universes in a Theory of the Existence of Multiverses [4].

With the analysis of concepts to define solutions, it is established that the cause of the expansion of the Universe arises in a state prior to an existential state of effective motion, in other words, it originates in a relative resting state. Thus, this study will focus on the analysis of extreme resting states of the Universe, delimiting a threshold for the current expansive existence, prior to the states proposed by other analyses.

Although it is not possible to observe the entire Universe or all its stages of evolution, it is possible to consider the following principles or points:

- Conceptually, the Universe (as a whole) is always the holder of any presence or existence [5].
- Existence is presence in constant transformation, or variation related to motion through interactions in Space, exchanging and varying energy (suffering attrition or wear) by thermodynamic laws, representing the dimension of Time.

- In representing the set of all existences, the expanding Universe is unique in that it doesn't exchange energy with anything external, it doesn't suffer attrition or wear from external interactions, and varying (since such variation already exists) only its internal energies in perpetual evolution (conversion of mass and energy).
- To begin or end the expansion motion of the Universe, it is necessary to leave or arrive at a resting state.

Based on the mentioned principles, the existential threshold of the Universe appears when its resting presence (absolute zero) is transformed into existence, in other words, when the motion begins, which represents the beginning of the variation of space and the temporal dimension for the Universal existence.

Considered the holder of all existence from the expansive beginning, or the holder of all the mass and energy present for the expansive beginning, the Universe cannot have its initial expansion generated by an exchange of energy with something external, because there is nothing external to the Universe.

Thus, the same laws that do not allow the existence of perpetual motion machines are the same ones that can allow the transformation or perpetual variation of state of the Universe, because as a single system, it neither loses nor can gain energy from another system, and as a whole, it (Universe) does not suffer wear or attrition with its exterior as it expands or continues its process of evolution; thus, all the transformation that the Universe will undergo in the process of expansion will be reversed in a process of contraction.

The Universal extreme resting state, because it represents an existential threshold that differentiates resting presences and existences that arise from the beginning of motion, is prior to zero-point energy or any quantum fluctuation (Casimir Effect), due to the momentary lack of motion (and thus with the lack of waves).

Thus, considering that cosmological models sometimes result from manipulations of relativistic mathematics that generate multiple viable (but divergent) solutions, that relativity provides solutions for describing the 3D spatial Universe, and based on the past presence of vanishing dimensions [6] [7], this study focuses on relating and organizing existing data to characterize the dynamics of the Universe, resulting from the presence of its 1D spatial states of maximum contraction or expansion.

Relativistic Calculations for One-dimensional Space [8]:

- $(8\pi G / c^4) T_{\mu\nu} = 0$ [8]
- $R_{\mu\nu} - \frac{R}{2} g_{\mu\nu} = 0$ [8]
- $\Lambda g_{\mu\nu} = 0$ [8]

In this situation, with the addition of the resting state, with masses and energies considered only from a transformation to a state of motion (which characterizes the presence of the variation of Time and the variation of Space), the analysis by means of the field equations (used only from the variation of Time) loses its relevance; thus, a possible analysis can be based on the use of concepts such as rest mass energy ($E_0 = -E_{pg} (=0) + E_k (=0) = 0$).

The dimension of time (1D) has established its presence in all states that promote a transformation; thus, in an extreme state, which will generate the information of the reach of the resting status, even with zero E_{pg} , and zero E_k , time has its presence, due to the fact that this information does not instantaneously reach the entire Universe, and therefore, has its configuration advancing with the emergence of the variation of energy and motion, through a transformation that generates the existence of universal expansion.

Regarding (Λ), the presence and later decrease of 1D and 2D masses forming 3D masses, with a centrifugal effect in our 3D Space Universe, could be considered as representatives of dark matter and dark energy.

Other points:

- The standard cosmological model assumes, through observational data, that the Universe is in a state of accelerated expansion, so past states of greater contraction, or future states of more intense expansion, are well accepted.
- The Universe is considered the holder of everything that exists [5] or of any presence, and through the restricted analysis of its extreme states, which characterize the beginning and end of its expansion, it is considered permanent.
- Some fundamental concepts are emphasized for a definition of Space that establishes the distinction between the Universe and its exterior.
- The consideration of the past presence of 1D Space and existence of 2D Space, based on the study of vanishing dimensions [6] [7], associated with a more intense logical and conceptual analysis becomes a viable alternative, since many existing studies are divergent, some suggesting a flat Universe ($\Omega \cong 1$) and others suggesting other properties [9] [10].
- It is also recognized that if the origin of the Universe is considered to begin with an expansion of 3D Space, and to end with a maximum dissipation in the same type of Space, the description of its complete evolution becomes infeasible.

In this original approach the maximum contraction state of the Universe is defined by the characterization of its maximum expansion state.

A sketch of the possible basic steps in the formation of the maximum contraction and expansion states related to the Standard Cosmological Model [11] is presented.

This study goes broader when it develops its own equation and provides a reason for the expansive beginnings of the Universe.

With the states of maximum contraction and maximum expansion, conceptually limited to being resting states, the possible result becomes unique by analyzing and connecting the existing data in a study that is easier to refine because of its simplicity.

II. The extreme states of universal evolution

To characterize the possible states of maximum past contraction and maximum future expansion, the following points should be emphasized:

- Space is the region that contains or is between masses; Thus, Space (occupied with mass or not) only has its presence or existence established when it belongs to the Universe, with mass or between masses. Outside the Universe (at every instant), Space is considered non-existent and absent. The type of space (3D, 2D or 1D) is related to the dimension of the masses.
- Energies represent states or components of the existing Universe [12].
- The Universe is considered finite (Hawking, S.W.) [9] or has a limited amount of mass and energy (set); its maximum contraction is limited to the maximum lack of unoccupied space (no mass) [there is no way to occupy more space (for contraction) if all possible spaces are already occupied (with mass)].
- In a state that tends to maximum contraction, the concentration of energy is maximum in a past of vanished dimension [6] [7], so the Universe tends to be completely linearized (1D Space).

Data re-analysis (2005) showed that the particle jets produced by energetic cosmic rays were aligned closer to a plane than would be expected, which could imply a reduction in dimensions. The vanishing dimensions indicate that the third spatial dimension can be reduced [6].

The lower dimensions have no 3D degrees of freedom, so are not susceptible to the propagation of three-dimensional gravitational waves. This fact represents a universal maximum frequency at which primordial waves (spatial 3D) can propagate, which marks the transition between dimensions [6].

- Alternatively, with the continuation of the current expansion, and with the complete dissipation of 3D and 2D masses, the future presence of the minimum possible amount of 1D masses (two masses) is considered, which conceptually can only be separated by the maximum 1D linear space in the state of maximum expansion.
- Extensive, varied, or complex mathematical calculations and alternative theories that may suggest several dimensions (higher than 3+1) as the Universe evolves, may make it difficult to visualize the clear result obtained by a simple conceptual analysis directed only to the specific state of maximum expansion of the Universe.
- No relativistic calculations are needed to define that the beginning of a motion (without fluctuations or oscillations) is characterized only by leaving a resting state, or that the end of a motion is configured only by the emergence of a resting state, since these are conceptual arguments easily perceived by the very definition of motion.
- At maximum contraction (1D Space), the universal spin is zero, just as the primordial Universe (3D Space) does not spin. Thus, spins can also arise from the formation of 3D cosmic structures [derivatives from others with a presence originating in the fundamental state (Space 1D)].
- The current Universe is considered flattened because of the angular momentum that can be generated at unexpectedly large scales [13].
- Entropy depends on the degree of freedom and disorder configured [14]; thus, the type of spatial dimension (3D, 2D or 1D), which depends on the stage of expansion of the Universe, influences entropy.
During the complete evolution of the Universe, with the extinction of 3D Space and the formation of 2D Space and subsequent 1D Space, entropy decrease.

- The mass that is formed or that decreases, varies only through the change of energy in the Universe, since the Universe is the holder of all existence [5] or presence.

Before the expansive beginning, the entire Universe had to be at resting status (with total absence of motion, zero kinetic energy or without vibration); there is no characterization of expansive beginning if there is already motion in a universal state of minimum Space.

The entire Universe will be at resting status when it reaches its maximum expansion; there is no characterization of an expansive end when there is still motion.

With the current expansion of the Universe, the status of maximum mass dissipation [consisting of only two minimum (1D) masses, separated to the maximum in the 1D Space] is expected in the future, preserving some presence, to a status of constant transformation, with the continuity of the time dimension.

The state (status) of the Universe is defined by its internal energies and, in parallel (considering the relationship between mass and energy), by the amount of mass that exists or has its presence configured.

As the extreme resting states of the Universe can only have the presence of 1D resting mass (therefore, without waves or motion, atoms, and molecules, or chemical, thermal, quantum [15], electrical and electromagnetic energies are non-existent); thus, the internal energies that can exist initially are the fundamental ones: gravitational potential (E_{pg}) and kinetic energy (E_k).

When the states of maximum contraction or maximum expansion are reached, the E_k will be Zero.

As the 1D Space is not considered to be curvable by the 1D mass and as the signal of complete linearity does not instantaneously reach the entire Universe in its extreme states of evolution (presence of unoccupied space between the 1D masses), the presence of E_{pg} can be maximized with a value of zero (due to the referential and because it is a binding energy), characterizing a state in which the presence of masses can still initiate a motion.

In the resting states, in the maximum contraction or maximum expansion of the Universe, the presence of 1D mass, 1D Space, and 1D Time does not constitute any existence as it is known. Considering that everything that exists, as well as having a presence, undergoes transformations related to motion or its variation (existence of the time dimension), the presence of mass, Space and Time will only represent existence when motion with the spatial curvature returns.

Thus, the presence of 1D masses in the extreme states of the Universe will represent the masses and energies that only will exist when they leave these extreme states, that is, only after the motion.

In the extreme states (of contraction or expansion), with the Universe in a resting state and in linear (1D) Space, the existing energy is:

$$[E_0 = -E_{pg} (=0) + E_k (=0) = 0].$$

Since the signal of complete linearity (variation of E_{pg} and E_k to zero values) does not instantaneously reach all the massive presences, that is, the information that the only mass presence that becomes one-dimensional at one extremity of the Universe does not instantaneously reach the mass at the other extremity (space between the masses), the extreme state of expansion or contraction ends up becoming unstable, with the return of motion, causing E_k and E_{pg} to return to non-zero values.

Observing that complete linearity, 1D Spatial dimension, complete resting state, - $E_{pg} (=0)$ and $E_k (=0)$ are linked and are characteristics of the extreme states of the evolution of the Universe, and that the formation of 2D Spatial dimension, return of motion, - $E_{pg} (\neq 0)$ and $E_k (\neq 0)$ are also linked and are characteristics of other states, it is possible to distinguish the resting state from the subsequent state of motion, and to characterize the curved trajectory in 2D Space.

This way, after a resting state, the evolution of the Universe continues, with the return of mass energy and a curvilinear motion, representing exactly the masses existing in the Space that becomes 2D.

Maximum Expansion State of the Universe

With E_{pg} equal to zero, the expansion ends with the kinetic energy (E_k) also equal to zero ($E_k = 0$) [16].

Thus, the extreme state of maximum expansion is defined by the following points:

- The 1D Space has a minimum occupancy.
- The space (between the presences of two minimum 1D masses) is maximum.
- E_{pg} is zero, E_k is zero; Spin is zero.

Considering the linear configuration of the extreme states, and the mass dissipation during the expansion of the Universe, it is possible to determine the constitution of the maximum contraction state from the maximum expansion state.

Maximum contraction state of the Universe

The maximum contraction state is the opposite of the maximum expansion state, that is, instead of the presence of two 1D minimum masses maximally separated in a presence of 1D Space, the presences of two minimum unoccupied spaces (1D) between three masses (1D) represent the Universe.

Thus, the universal structure (in its maximum contraction) consists of the presence of a maximum 1D mass, a minimum unoccupied 1D space, a minimum 1D mass (particle), another minimum unoccupied 1D space and another maximum 1D mass.

The extreme state of maximum contraction is defined by the following points:

- The presence of maximum 1D space is occupied maximally by the presence of 1D masses.
- E_{pg} is zero, E_k is zero; Spin is zero.

The evolution of the Universe, that is, its change of state must be analyzed through the variation of its internal energies, which subsequently generate a variation of mass.

III. Einstein field equation for 1D Space + 1D Time dimensions.

(The presence of a 1D Time dimension is configured from a state that promotes a transformation through motion or its variation. Thus, a resting state that will generate a variation of energy and motion configures the presence of Time).

The Einstein field equation (EFE) appear as

$$R_{\mu\nu} - \frac{1}{2} R g_{\mu\nu} + \Lambda g_{\mu\nu} = (8\pi G / c^4) T_{\mu\nu} \quad (1)$$

The Riemann tensor can be expressed [in (1+1) dimensions] as

$$R^{\gamma}{}_{\nu\alpha\beta} = R / 2 g^{\gamma\mu} (g_{\mu\alpha} g_{\nu\beta} - g_{\mu\beta} g_{\nu\alpha}) \quad [8]$$

(R = curvature scalar and $g_{\mu\nu}$ = metric tensor)

With (1+1) dimensions:

$$(8\pi G / c^4) T_{\mu\nu} = 0 \quad \text{and} \quad R_{\mu\nu} - \frac{R}{2} g_{\mu\nu} = 0 \quad [8]$$

(The energy–momentum tensor ($T_{\mu\nu}$) vanishes). [8]

With $\Lambda g_{\mu\nu} = 0$, the energy and pressure density are equal to zero (presence 1D masses at momentary resting status), before all mass dissipates in a complete expansion, or before all unoccupied space between the masses disappears in a complete contraction.

A resting state in complete contraction would not characterize the beginning of the motion for the current expansion, because the Universe (the entire presence) would be formed by a single 1D mass.

A resting state in complete expansion, would also not characterize the motion, due to the lack of something that can move or even the absence of Space (with Space considered as the distance between presences or existences).

A state of maximum expansion that has the same amount of 1D mass of the state of maximum contraction would not be possible, because the expanded state would reach rest ($E_k = 0$) with masses forming 3D Space (in 3D Space) which would be curvable: $[-E_{pg} (\neq 0)]$.

General Relativity (GR) considers the local non-existence of gravitational degrees of freedom or gravitational waves in 1D and 2D Space.

Regardless of the process, when the Universe makes a transition from 1D to 2D Space until it reaches 3D Space, through the motion that intensifies, necessarily the masses come closer together.

Thus, since the signal of complete linearity in 1D Space, or the subsequent signal of flattening, does not go through the entire Universe instantaneously (presence unoccupied space between the masses for the beginning of the motion), there is the promotion of an increasingly curved motion, until the formation of 3D Space; the important point to note is that the Universe will reach its 3D Space with a lesser gravitational potential energy and a greater kinetic energy than those existing in its lower dimensional states, from the return of the motion.

For the initial formation of 3D Space: $[\text{Energy} = -E_{pg} (\text{decreases}) + E_k (\text{increases})]$. Subsequently, the evolution continues and then the variation in the amount of mass happens during the remainder of the process.

IV. The evolution of the internal energy variations of the Universe from the states of maximum contraction and expansion

For the momentary states of universal resting (maximum contraction and expansion) and the energetic evolution of the Universe, the following points are assumed:

- E_{0C} = Rest mass energy of the maximum Contraction state:
 $E_{0C} = -E_{pg} (=0) + E_k (=0) = 0.$

(The presence of 1D masses does not curve 1D Space; such massive presences only configure their existences from the return of motion).

- E_{EI} = mass energy of the initial Expansion state:
 $E_{EI} = -E_{pg} (\neq 0) + E_k (\neq 0) = 0$
- $VEME$ = Energy associated with the mass reduction (through dissipation) in the expansion process.
- E_{0E} = Rest mass energy of the maximum Expansion state:
 $E_{0E} = -E_{pg} (=0) + E_k (=0) = 0$

(The presence of 1D masses does not curve 1D Space; such massive presences only configure their existences from the return of motion).

- E_{CI} = mass energy of the initial contraction state
 $E_{CI} = -E_{pg} (\neq 0) + E_k (\neq 0) = 0$
- $VEMC$ = Energy associated with the formation or increase of mass (and concentration) in the contraction process.
- $M_0 - m_0$ = presence of Minimum mass (1D particle; where $M_0 > m_0$, and $M_0 \cong m_0$)

- $M_0 + M_0 + (M_0 - m_0)$ = presence of the Maximum total 1D mass of the Universe for the initial expansion state (If it were possible the non-presence of two 1D minimum unoccupied spaces).
- The masses $[M_0 + M_0 + (M_0 - m_0)]$ subtracted from $2 (M_0 - m_0)$ that would correspond to the two (1D) masses that could occupy the two minimum (1D) unoccupied spaces =

$$[M_0 + M_0 + (M_0 - m_0)] - (M_0 - m_0) - (M_0 - m_0) = M_0 + M_0 - (M_0 - m_0) =$$

$M_0 + m_0$ = Maximum total 1D mass of the Universe for the initial expansion state [with the necessary presence of the two minimum (1D) unoccupied spaces].

- There is no energy directly associated with the presence of the unoccupied spaces (1D) in these extreme states of the Universe. Such presence is related to a determined amount of mass) in states of maximum, but not complete, contraction or expansion.

The steps of the process of evolution of the Universe

1. state for the beginning of the expansion:

The universal structure in this state consists of a maximum 1D mass, a minimum 1D unoccupied space (without mass), a minimum 1D mass (particle), another minimum 1D unoccupied space (without mass), and another maximum 1D mass, all distributed over a maximum distance of one dimension (presence 1D Space).

The Universe in momentary linear Space (Maximum Contraction):

$$E_0C = -E_{pg} (=0) + E_k (=0) = 0.$$

(The presence of 1D masses does not curve 1D Space; such massive presences only configure their existences from the return of motion).

Rest mass energy for the initial expansion state (With the signal of the state of complete linearity not reaching the entire Universe instantaneously)

Maximum mass to exist:

$$\begin{aligned} [M_0 + M_0 + (M_0 - m_0)] - (M_0 - m_0) - (M_0 - m_0) = \\ M_0 + M_0 - (M_0 - m_0) = M_0 + m_0 \end{aligned}$$

$$EEI = -E_{pg} (\neq 0) + E_k (\neq 0) = 0$$

With Mass of an initial expansion state = $(M_0 + m_0)$, the energy [17] available to begin an expansion of the Universe (AEEI):

$$AEEI = [\text{Variation of } E_{pg} \text{ and } E_k \text{ between } EEI \text{ and } E_0C \text{ states}] = (M_0 + m_0) \times c^2 \quad (2)$$

The value of this energy must be extremely high (as high as possible) to be able to initiate the motion of the maximum possible amount of mass that can exist.

During the expansion, with the dissipation and after the beginning of the decrease of the mass and its corresponding energy, through the exchange between the existing internal energies, the Universe will reach the minimum possible amount of mass and begin the contraction motion of the minimum mass (1D) whose presence will be configured.

After the beginning of the expansion motion, the Universe will continue to evolve until it reaches its maximum expanded state, which consists in the presence of two particles $[2 (M_0 - m_0)]$ of minimum (1D) mass at the extremities of the maximum unoccupied (1D) Space.

Thus, from the state of maximum contraction to the state of maximum expansion, the Universe, through dissipation, will have a decrease in mass corresponding to the following energy (VEME).

Energy associated with the mass reduction in the expansion process:

$$(VEME) = [(M_0 + m_0) - 2(M_0 - m_0)] \times c^2 = \\ [(m_0 + m_0) - (M_0 - m_0)] \times c^2$$

2. State for the beginning of the contraction:

The universal structure in this state consists of a minimum 1D mass (particle), a maximum 1D unoccupied space (without mass), and another minimum 1D mass (particle), distributed over a maximum distance of one dimension (presence 1D Space).

The Universe in momentary linear Space (Maximum expansion):

$$E_0E = - E_{pg} (=0) + E_k (=0) = 0.$$

(The presence of 1D masses does not curve 1D Space; such massive presences only configure their existences from the return of motion).

Rest mass energy for the initial contraction state (With the signal of the state of complete linearity not reaching the entire Universe instantaneously)

Minimum mass to exist (1D):

$$[(M_0 - m_0) + (M_0 - m_0)] = 2 (M_0 - m_0)$$

$$ECI = - E_{pg} (\neq 0) + E_k (\neq 0) = 0$$

With Mass of an initial contraction state: $2 (M_0 - m_0)$, the energy available to begin a contraction of the Universe (AECI):

$$AECI = [\text{Variation of } E_{pg} \text{ and } E_k \text{ between ECI and } E_0E \text{ states}] = 2 (M_0 - m_0) \times c^2 \quad (3)$$

The value of this energy is enough to initiate the motion of the minimum possible amount of mass that can exist.

During the contraction, with the beginning of the formation or increase of mass and its corresponding energy, through the exchange between the existing internal energies, the Universe will reach the maximum possible amount of mass and begin the expansion motion of the maximum mass (1D).

From the state of maximum expansion to the state of maximum contraction, the Universe will have an increase in mass due to formation, corresponding to the following energy (VEMC).

Energy associated with the formation or increase of mass in the contraction process:

$$(VEMC) = [(M_0 + m_0) - 2(M_0 - m_0)] \times c^2 =$$

$$[(m_0 + m_0) - (M_0 - m_0)] \times c^2$$

Internal energetic exchanges during the process of universal evolution, according to the presented maximum states of contraction and expansion:

Expansion: AEEI – VEME (decrease in mass) = AECI

$$[(M_0 + m_0) \times c^2] - [(m_0 + m_0) \times c^2 - (M_0 - m_0) \times c^2] = 2 (M_0 - m_0) \times c^2$$

$$(M_0 + m_0) \times c^2 - (m_0 + m_0) \times c^2 + (M_0 - m_0) \times c^2 = 2 (M_0 - m_0) \times c^2$$

$$[(m_0 + m_0) \times c^2 + (M_0 - m_0) \times c^2] - (m_0 + m_0) \times c^2 + (M_0 - m_0) \times c^2 = 2(M_0 - m_0) \times c^2$$

$$(m_0 + m_0) \times c^2 - (m_0 + m_0) \times c^2 + (M_0 - m_0) \times c^2 + (M_0 - m_0) \times c^2 = 2 (M_0 - m_0) \times c^2$$

$$(M_0 - m_0) \times c^2 + (M_0 - m_0) \times c^2 = 2 (M_0 - m_0) \times c^2$$

$$2 (M_0 - m_0) \times c^2 = 2 (M_0 - m_0) \times c^2 \quad (4)$$

Contraction:

AECI + VEMC (increase in mass) = AEEI

$$[2 (M_0 - m_0) \times c^2] + [(m_0 + m_0) \times c^2 - (M_0 - m_0) \times c^2] = (M_0 + m_0) \times c^2$$

$$(M_0 + M_0) \times c^2 - (M_0 - m_0) \times c^2 = (M_0 + m_0) \times c^2$$

$$(M_0 + m_0) \times c^2 = (M_0 + m_0) \times c^2 \quad (5)$$

It's important to note the following:

The process of Universal evolution is permanent because there is always the presence some mass, and unoccupied space (without mass) in the extreme states, that is, all the amount of mass that decreased in the expansion process is always restored during the contraction process.

The presence of unoccupied space between the masses (1D) in extreme states of evolution, with the sign of these resting states of complete linearity not instantaneously reaching all the 1D masses throughout the Universe, preserves the presence of a continuous process of transformation that makes the Universe permanent.

If existence is considered as presence (with a certain defining characteristic) in constant transformation related to motion or its variation, representing Time, the Universe can be considered the greatest example of existence (with its defining characteristic being the fact that it always contains all existence or presence).

V. The Complete Evolution with Fundamental energies

An evolution is presented with the fundamental energies (Potential and Kinetic), derived in a simplified way (sketch) from the actions of all the other energies that exist during a significant part of the evolution of the Universe.

The dark energy that exists is related to the increase in the Universe spin effect due to the increase in the amount 3D mass, making the current expansion accelerated.

The Dark matter is represented by the presence of lower dimensional masses.

Figs. 1–2 illustrate that any contraction and expansion, although intense, cannot be total; revealing that the Universe is always transforming (= existence).

The linearity is not visually perceptible, the following sketch is illustrating the energy evolution of the Universe to make more understandable the meaning of M_0 , m_0 , and $(M_0 - m_0)$.

Figure 1. Universe (1D maximum contraction, 2D, 3D, inflation, 2D, 1D or maximum expansion)

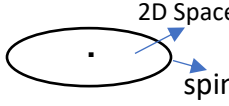

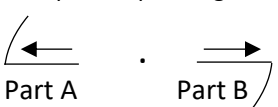
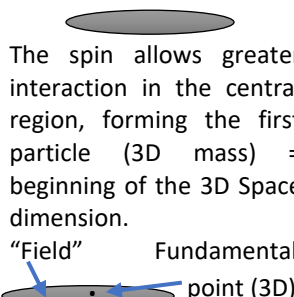
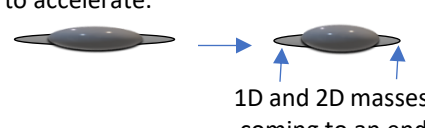
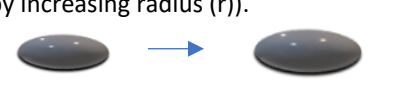
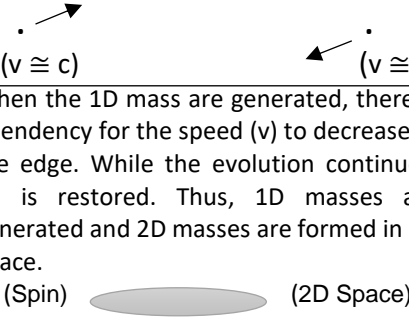
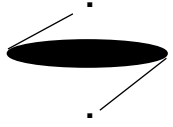
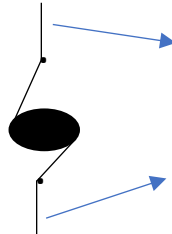
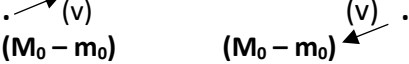
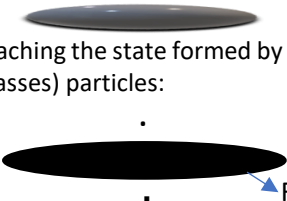
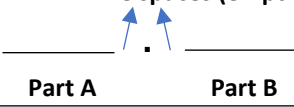
<p>Expansion: Space created by the interaction, groupings, motion, or dissipation of masses (1D, 2D, or 3D). Expanding 3D Space: (1D and 2D) masses to 3D masses, except in the post-accelerated expansion phase</p>	<p>Angular momentum (L) = radius (r) x mass (m) x angular velocity (w). 1D spatial dimension to 2D Space = the formation of an edge = approximation of the parts A and B [radius (r) decreases and (w) increases] = E_k (spin) increases and E_{pg} decrease.</p>	<p>The first 3D mass formation depends on the non-flattening of the Space = mass (energy) concentration = mass 3D ($E_0 = m_0 \times c^2$) = "excitation" of the field from 2D to 3D by curvature 3D central space.</p>	<p>Studies propose a flat or closed Universe [9] [10]. Extreme linear states of space are definers of the continuity of evolution. Dark (matter and energy) are related to the agglomerations of 1D and 2D mass particles [that by grouping together (appropriately), "excite" the field and form more massive particles three-dimensional (3D masses)]; [18], thus, they can accelerate the expansion of our Universe (3D Space dimension). Dark energy = mass energy (1D and 2D) to 3D, increasing the (w) or spin effect (centrifugation).</p>
<p>Maximum Contraction:</p> <p>Part A (1D) ↓ ↓ Part B (1D) The spaces (empties) $E_{pg} = 0$ [maximum mass (1D) distributed in maximum presence of Space 1D]. $E_k = 0$; Spin = 0. Motion = 0. Minimum unoccupied Spaces (between masses).</p>	 <p>From the 1D spatial dimension (presence maximum 1D mass) to the 2D spatial dimension = Expansion (2D space formed).</p>	<p>With the first 3D Space curvature and more groupings, the amount of 1D and 2D masses (particles) decrease, while the amount of 3D masses (of 3D internal space) increases (generating or increasing 3D Space = form or increase surface of the ellipsoid that represents 3D Space Universe. 2D Space to 3D Space = mass (as a whole) approaches, radius (r) decreases, and (w) increases = E_k (spin) increases and E_{pg} decrease.</p>	<p>After the maximum formation of 3D masses in ample 3D Space, the expansion begins to slow down. With the 3D mass tending to dissipate (expansion), E_k, and the intensity of the spin decreases.</p>
<p>Presence of Part A (m_0), Part B (m_0), particle ($M_0 - m_0$) and two spaces (1D) empties; ($E_k = 0$); The fact that the signal of complete linearity (with E_{pg} and E_k variation) does not instantaneously reach the entire Universe (presence of unoccupied spaces between the presence of 1D masses) means that E_k and E_{pg} become non-zero again with the return of motion. The total amount of mass (1D + 2D + 3D) is not conserved in the process of evolution.</p>	<p>Groupings in the edge (Presence of the central particle) begin to form particles with 2D masses (filling the interior of the 2D Space = the contraction of the edge of the existing 2D Universe). With the amount of 2D masses increasing to the maximum, the 2D mass concentration increases (in 2D Space), the spin increases = E_{pg} decrease and E_k increase.</p>	<p>The formation of 3D masses from 2D masses by all 2D Space almost instantaneously forms the surface of the ellipsoid (3D Space) = Inflation. After inflation the interaction between the 1D and 2D masses happens more slowly, making the expansion less accelerated. As long as 1D and 2D masses interact and form 3D masses that generate 3D Space, so that the radius (r) continues to decrease, the velocity or speed (w) continues to increase, decreasing E_{pg} and increasing E_k, the current expansion of the universe will continue to accelerate.</p>	<p>Future of expansion: Spatial Universe, flat (2D).</p>  <p>(Expanding Disk) (Spin) The 3D spatial dimension becomes 2D Space (Disk); spin and E_k decrease; E_g (potential) increases. with less and less mass. For maximum expansion, the smallest masses (1D particles) arise: 2 ($M_0 - m_0$) separated by presence of the maximum space.</p>
<p>Expansive process begins. 1D Space expanding to 2D:</p>  <p>Part A Part B The expansive beginning [13] (with a curved path) is guided by the fact that the signal from the state of complete linearity reached, does not instantaneously reach the extremities (due to the unoccupied space between the masses).</p>	 <p>The spin allows greater interaction in the central region, forming the first particle (3D mass) = beginning of the 3D Space dimension. "Field" Fundamental point (3D) Our 3D Space Universe began as a 3D particle (point), 1D and 2D masses (Field). Beginning later Planck era (3D Space).</p>	 <p>1D and 2D masses coming to an end</p> <p>Decelerated expansion: (E_k) decreased by increasing radius (r).</p>  <p>Under these conditions, E_{pg} increases, the spin of the Universe and its centrifugal effect decrease, causing the expansion to decelerate.</p>	<p>Linear Space ($M_0 - m_0$) ($M_0 - m_0$)</p> <p>The Universe does not continue to expand (the presence of two minimum particles with mass (1D) preserves some presence); the Universe can never be completely homogeneous (empty space between masses).</p>

Figure 2. Universe (1D maximum expansion, 2D, 3D, 2D, 1D maximum contraction)

<p>As universal evolution progresses, the variation of space causes the interaction of the 1D, 2D, and 3D components to vary, and thus both the formation time and the dissipation time of the structures may vary.</p> <p>In the state of maximum expansion: $E_k = 0$ with linear Space. The fact that the signal of complete linearity does not reach the entire Universe instantaneously (presence of the unoccupied space between the 1D masses) means that E_k and E_{pg} become non-zero again, and as the masses approach (the motion returns). The only possible motion that corresponds to an increase in E_k (in this case) is a contraction.</p>	 <p>(Spin) (2D Space)</p>	<p>E_k has not maximum decreased and E_{pg} has not maximum increased; thus, there is still the E_k or the spin to continue the contraction until it reaches 1D Space.</p>  <p>The spin (centrifugation) allows the existence of space for motion only between the edge of the disk and the particles (shape of the surface of a double cone). This shape (by equilibrium) does not allow the two particles to approach in the direction of the disk. In its maximum state of contraction, the disk (without internal spaces) loses its internal gravitational effect, the contraction continues (spin) to 1D Spatial dimension.</p>
<p>Contraction: masses can be naturally generated by the variation of Spaces. E_{pg} begins to decrease and E_k to increase with presence of two minimum 1D masses (in 1D Space) beginning their motion; 1D Spatial dimension [with minimum (1D mass)] to 2D Spatial dimension = contraction.</p> <p>The beginning of the motion promoting the existence of a curved way in 2D spatial formation.</p>	<p>Total amount of mass (1D and 2D) increase. Since the possible amount of mass to be generated has not yet been reached, the continuation of the contraction will produce 3D masses that will maximally occupy a 3D Space.</p> <p>[2D Space that expands generating 3D Space (with a constant amount of total mass) = expansion, but 2D Space that contracts, increasing the amount of total mass, generating 3D mass and 3D Space (occupied) = contraction (relationship between mass and energy proposed by Einstein's equation). When 3D Space, with a constant amount of mass, form lower dimensional Space = contraction].</p> <p>When the formation of 3D masses ends, the 3D state is one of intense contraction or concentration; due to a centrifugal effect of spin; the contraction process makes the Universe reach the shape of a 2D flat disk + two particles (1D masses).</p>	 <p>Future Part A (Spin) Future Part B</p> <p>The disk decreases from the edges with the spin, and through the unoccupied space (shape space: double conical surface). The homogeneous distribution of mass from the disk to the future parts (A and B) is defined by spin and entropy.</p>
 <p>Just as the Relativity of time varies according to the speed and gravity, the spatial dimension is guided by energies variations E_{pg} and E_k.</p> <p>Limited variation in time relativity \leftrightarrow mass (or energy concentration) limited in 1D, 2D or 3D Space \leftrightarrow limited contraction and expansion.</p> <p>When v tends to c, the only way to complete the process, by decreasing E_k, is to increase E_{pg} with the generation of presence of 1D mass [mass and energy (Einstein's equation)], which happens more easily in 2D Space due to the lack of Space(3D).</p>	<p>3D and 2D to 1D Space: Flattened Universe with a constant 3D amount of mass, with increasing E_{pg} and (r), and decreasing E_k, (w), and spin:</p>  <p>reaching the state formed by disk + two (1D masses) particles:</p> <p>This incomplete maximum contraction will consist of a fully compressed disc, between two particles (symmetry); The spaces represent the presence of potential energy [maximum mass of the disk between the two (1D mass particles)].</p>	<p>The spaces (empties)</p>  <p>Part A Part B</p> <p>Consecutive new expansion: Through linearization, the Universe returns to a spatial dimension (1D); the state of maximum contraction reappears. The parts present are separated by necessary central (unoccupied) spaces and a minimum particle (1D mass). Parts A, B, and the particle (1D mass) completely reach the 1D space dimension, and expansion resumes. Entropy tends to become smaller and smaller as the Universe approaches a state of 1D Space.</p>

VI. Conclusion

This article describes how motion can arise from resting universal states.

Complement to the standard cosmological model (considered the most suitable by the data collection) is described (with the preservation of causality, or the relationship between action and reaction).

Our Universe (3D Space) in motion will be considered formed from a 1D spatial state [6]; a broader analysis of this previous state is proper to complete an understanding of the process.

The centrifugal effect and the presence of lower dimensions will be considered the representatives of dark energy and dark matter.

The consideration of an analysis of the Universe (3D Space, observable and mathematically described) that begins its expansion at a given instant and will end it, must be done in conjunction with an analysis of a generating Universe (1D Space) to this model of complete evolution.

With the generation of a centrifugal effect associated with gravity, a flattened state tends to be formed with curved edges. A linear state is considered at maximum expansion.

Just as components (ingredients) are always necessary for any formation, i.e., something cannot be generated from nothing, the end always generates some presence.

The need for quantum gravity to characterize an origin of universal motion becomes unnecessary, since all energies result only from the fundamental ones: E_{pg} and E_k .

There is no scope for vibrations or oscillations in truly extreme and resting states.

Well-established concepts prevent the description that any expansion can have been preceded indefinitely from an infinite past.

It was pointed out that there can be maximum contraction to a single spatial dimension, but not so intense to be complete; similarly, maximum expansion (1D space unoccupied between the presence of minimum 1D masses) can only occur without the complete expansion.

Experiments with neutrinos (2020) show the possible asymmetry in the formation of matter and antimatter [19] [20].

Symmetry may occur only in the contraction + expansion set.

Entropy tends to become smaller and smaller as the Universe approaches a state of 1D Space.

The concept of rest mass energy ($E_0 = 0$) in 1D (Space) was used, which allows certain relativistic and quantum calculations to be excluded (4D=3D (Space) + 1D (Time)).

Relativity, Einstein's field equations and the formal use of the Friedmann equation are considered the best tools for the analysis of the 3D Space Universe. However, for the study of the maximum contraction and maximum expansion phases of the Universe (of 1D Space), with the presence of 1D masses in a momentary resting state ($E_k = 0$), when the analysis is restricted with the following points [8], with the addition of the resting state:

- $(8\pi G / c^4) T_{\mu\nu} = 0$
- $R_{\mu\nu} - \frac{R}{2} g_{\mu\nu} = 0$
- $\Lambda g_{\mu\nu} = 0$

was used Einstein's rest mass equation, as auxiliary to complete the standard cosmological model.

Contractions and expansions are limited, but permanent in continuous cycles.

The model presented was able to clarify why the Universe begins its spin with the beginning of the expansion [13].

This alternative study can be seen for its coherence in presenting the causes and effects present throughout the evolution of the Universe.

The use of the theory of relativity was limited to foundations for the analysis of universal states not yet explored. Thus, the possible analysis of the Universe in its state before the beginning of the motion of its expansion is indirect, considering the relation and validity of concepts already well accepted, because the current existence, which allows the full use of relativistic mathematics, is characterized in phases of motion.

With the information about a state of complete linearity having been reached (in the extreme universal states of contraction or expansion) not having propagated throughout the Universe instantaneously (unoccupied space between massive presences and there are no quantum components), there is the promotion of the curvature of space-time by means of a transformation, which is only possible through the configuration of a motion, that is, an acceleration.

The complete description of the evolution of the Universe can provide a better understanding of the meaning of existence by defining permanent transformations through interactions related to motion and its variations in Space.

Relating the current existence of the Universe to the concept of motion could define the most extreme states of evolution as being states of resting, restricting the relativistic use to the only possible possibility for these states.

The conceptual analysis of the extreme states of the evolution of the Universe, which limit the number of possible solutions, becomes an additional tool in the construction of a theoretical model complementary to the Standard Model, which can be inserted in the range of options already published.

Some manipulations of relativistic mathematics can lead to several less consistent results by proposing many additional variables.

This approach respects the Ockham's razor perspective and the principle of parsimony. The best explanation should assume the fewest number of premises [21].

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