The thermodynamic inwardly open system by locally decreasing entropy originates life

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Abstract

The bosons emergence in the Big-Bang in the spaceless universe, by a causal coupling, originates the 4th dimensions. The chronology of bosons that occupied the same quantum state, could allow characterizing the expansion from which develops a treatment without *ad hoc* inflation. The fundamental property of quantum entanglement, allows 8×10^{60} bosons, because occupied the same *quantum* state became causally interconnected, shaping space as an irreversible thermodynamic continuum. The uncoupling of forces results in the emission of gravitational waves, expanding outwardly emerging by enlarging space. The doubling of the time required for simultaneous photons splitting, increase the wavelength-*locus* by two, and decrease the frequency by half, by its screw motion distends to left and right the space. At the time of the initial first 100 seconds has dissipated the associated Big-Bang's sound. Energy quantization within the plasma state, eventually leads into baryonic emergence, shaping the: protons, electrons and neutrinos/antineutrinos. The gravitational waves at primordial stages may create space disaggregation, which emergence of the quantum space confining energy by the quantum mechanics shaping of particles. Thus, separates the continuum of causality and the entanglement, defining *quantum* parameters of chemical bonding configurations for atoms and molecular structures. At the dark Ages the oscillation aligning the spins of hydrogen atoms, a *quantum mechanics* process, results in 21 cm photons emission. At present are detectable by its elongation to about 250m wavelength. The very large elongation of gravitational waves leads to a remaining vibrational power, impacting into the plasma leading to emission of sound waves as observed as wavelength decreasing acoustic peaks. The Recombination Era manifests the kinetics of collision between hydrogen molecules by the sound waves impacting in a wide angle over the soup of particles generating polarized CMB photons. The latter, has been characterized by black body emission of a thermal radiation, detected at present by the about average 2-3 cm of wavelength characteristic of the cosmic microwave background (CMB). This allows observed the homogenous structures that lead to develop inflation theory as a function of a greater than c velocity, which the presented solution to the problematic of homogeneity is solved by the Planck's identical *quantum* states. The eventual accumulation into *voids* of thermal photons allows being a manifestation of the cosmological constant predicting to be a form of energy, resisting to gravitational attractions, response shown by the molecules of hydrogen, generating stars and galaxies. These ones are subject to their mutual distancing by Hubble's law recession, balancing with gravitational attraction. This decompression of space between galaxies requires fine tuning in order to maintain critical density. The latter, implies that events are not related at random because of a c chronology restricting the doubling of the time splitting and the elongation parameters started from the emission source. These parameters has to align expansion vectors and this is obtained by an iterative response that conserve the total angular momentum, distending space by balancing rotational velocity within the universe. Any deviation could break this balance and produce changes in distribution of angular momentum, which has to be compensated by a restorative opposite feedback rotation as a regulatory mechanism. The solar dependent at transition of H_2O from liquid to vapor and cycling condensation allows the transfer of H-bonds between these two states. The much lower temperature for same biological process is generated by conformational changes of the protein attracting to their structure by separating individual molecules of water from its natural polymeric state. Thus, produces turnover by release of H-bonds. These molecules circulate stabilized by polar attraction until could be exhaled as a 5% in the oral cavity as gas form. Thus, membranes allow to localize decreases of entropy that powers the evolution of life.

Introduction

The evidence obtained [1] implies that the system exists as energy confinement, which can be kept stable by inertial mass, while the underlying energy is less than the activation temperature. The

evolution of the confinement or locus energy-space is governed by the increase in entropy, an increase in the area and decrease of its curvature.

The electromagnetic dispersion maximums, identifiable as wavelength rates of the electron, predict the ondulatory behavior of matter in motion could be analyzed conceptually by a Schrödinger box (box-S). Then, this by dilation of its width simulates energy emission and by contraction, absorption, stepped as potential or energy levels by decreasing or increased enthalpy. This is configured by the increase in entropy as a decrease in space curvature.

The bosons do not respond to the Pauli exclusion's principle, which allows these maximal nodes of energy to occupy the same quantum state. Thus, in opposition to the fermions allowed localizing into singular multi-levels of energy. The result is an overlapping bosons interconnected along one dimension of the space by the hierarchical expression of entanglement convergence. This problematic applied to the curved space-time offers a solution within theories of the *quantum* field [2].

The model of photon splitting and elongation in cascade was solved by parametric down conversion (PDC) treatment. The genesis of the CMB map from and open on time system according to quantum Planck metric shows a force coupled to expansion. CMB could be characterized as a thermal radiation by black body emission, dimensioning space as a function of temperature. Hence, decreases frequency by PDC according to Planck's law and Boltzmann contributions. Therefore, one photon is divided into two and each one lengthens, reducing its frequency, and distending in space, by increasing localization volume by $\frac{V_2}{V_1} = 8$, and a final increment of 16 times the initial volume [3].

Photon elongation, decreasing frequency, is not conserving energy by itself, but through its coupling of splitting, compensating by its link with of the photon number increment and concomitant dimensioning of the space location, sized by the wavelength elongation.

However, after the dark ages, the surging stars emitting not only thermal photons, which lack response to gravity, but also the ones produced by internal nuclear hydrogen fusion into helium and radiated from the stars surface, which does responds to gravity.

Hence, if applying PDC, starlight emission shows elongation incrementing volume. Hence, in an enthalpy vs entropy relationship, the H_2 generator of starlight process consuming H_2 enthalpy and thermal radiation accumulating as entropy.

Thus, inferring an inwardly open system [4], in which galaxies pulls-in the H_2 cold dense gas expulsed from the *voids* inside that become entrapped by the incremental volume of *voids*. This process by the continuous accumulation of thermal radiation transfers to the outside of *voids* the hydrogen gas to be capture by galaxies.

The distending void space also dilutes heat and refrigerates the hydrogen to be expulsed. This model relating the flow of hydrogen into the gravitational galactic space consumes hydrogen. Thus, the hydrogen produces mass and momentum that increases the enthalpy of the stellar system. Particles of matter as was shown by Louis de Broglie when larger the momentum, the greater the energy, or wavelength-frequency, increasing by the same proportion of a photon wavelength. Thus, the momentum allows the hydrogen gas to reach the pressure intensity required to preserve the galactic contour, and conserves the galaxy shape. Accordingly, since astronomically a cold gas could remain undetectable, the presence of this process could make unnecessary to propose a never found dark energy.

The stars mass are dissipated by radiation and the total energy has to be conserved according to ΔG, entropy of the system increases by the void capturing thermal radiation, which does not respond to gravity.

The air conditioner equipment allows an analogy by the effect of increasing by electrical impulse, the enthalpy of the system, which in this case is the connection to electric power. Thus, allowing a temperature decrease by flow reversal by the transfer of the internal heat to the outside, and the cooling effect within the internal home structure.

The look for the cosmological constant is revealed as a mechanism of coupling, linking gravitation to the inflow of matter, and emission of starlight, jointly to the outflow of the expansionary thermal radiation, within an open system in the self-

contained space. Thus, an inward location of entropy in *voids* because could not be expulsed by the self-contained universe. Cosmic-scale expansion could not pull-apart galaxies, but does separate them, according to the Hubble's law. This one reflects the *voids* tendency to distance each galaxy from all others, and the redshifts reflects that as light propagate through space stretching-out, photon splitting adds to elongation, does making unnecessary to propose a z values in excess of c.

Results

Motion within-in the dynamics of space requires analysis of more than of one parameter, for the characterization of the momentum-impulse of the hydrogen, within the cosmos. The voids localized by expansion displace the gas hydrogen to their outside. The impulse of the gas allows its hydrogen mass to be enclosed by the gravitation field of nascent stars. The hydrogen impulse will show recoil with momentum splits into at previously enthalpy event, described as a forward pressure and its backward pressure into an opposite sense. Thus, allows the momentum of hydrogen to be forced-back its recoil-entropy of thermal radiation to be discharged-back into enlarging the voids, because by a cooling effect increases the wavelength of thermal photons, expanding them within the *voids*.

The analogy with a firearm the gunpowder ignition confers impulse to the bullet (cosmologically the bullet becomes it the hydrogen pointing to a target), and its recoil gunpowder energy could be considered as a form of energy, transferring momentum to the bullet, conserved as a recoil of gas expansion, creating entropy by the decreasing density, by its expanding space enlarging volume. Hence, at the border of the universe the density of energy could be expected to increase by the approaching to the velocity of light providing a resistance and contention effect and therefore acting as a *cuasi*-bottleneck, determining the flattening curvature.

Hence, a change in the direction of the original momentum, acquired by the gas hydrogen overcomes the inertial resistance of the molecules, in analogy to a bullet impulse, which depends of the decreasing density of the recoil space by asymmetry of opposite sense between forward and backward to overcome the inertial tendency. The recoil reflects the relationship to entropy to the enthalpy acquired by the bullet, which characterized occupies a larger space, does involved in the generation in the Hubble effect of distending space. Accordingly, to the De Broglie equivalent momentum of heat also has a wavelength and can be defined as thermal radiation. The latter, is inert to gravity and therefore could be confined inside the voids and outside a gravitational field. Thus, in expansion cooling of this thermal energy or entropy increases the volume of energy localization according to PDC.

Hence, if positive pressure is coupled to gravitation pulling, the opposite negative pressure is coupled by PDC expansion when cooling by decreasing frequency produced photon elongation, which shows as a pressure over galactic contour. Hence, disaggregation by the individual stars results from the opposing of the momentum of any tendency to centralization effect incorporating star energy by gravitation and black holes.

This equilibrium maintains operative the cosmological constant. This theoretical frame work is supported by astronomical observation.

1) The galaxies gravity does not oppose expansion.

2) Galaxies size is in equilibrium between gravity and the angular momentum of the gas hydrogen, which makes then-up.

3) The discovery of Lyman-alpha blobs emitting light in the frequency of hydrogen glows (or brightness), this expansion cooled gas flows into young galaxies from intergalactic space.

4) These are containing hydrogen gas expanded over larger space of about 300,000 light years, which are much larger that the Milky Way dispersed in large number all over the universe, which is additional to baryonic mass. This number is in a cycle shifting continuous of baryons flowing into stars. Thus, increasing in mass indicates that most of the baryons in the universe are not inside galaxies. Therefore, increases the 5% matter currently present in the cosmos.

5) Thus, hydrogen by a cooling process decreases frequency and increases wavelengths, allowing photons to distend space as suggested by the mechanism of splitting and elongation cascade, which confers momentum to galaxies separation as an operator of Hubble's law.

6) Assuming that gravitational attraction confers to hydrogen positive pressure, conservation of total momentum requires a feedback of opposite sense. Thus, imposes a feedback of thermal radiation into *voids*.

7) Accordingly, other cosmologists theorized that as time allowed expansion, matter thinned-out and the strength of the unnecessarily dark energy. Hence, the postulation that entropy accumulated into *voids* as receptors of thermal radiation could show a negative pressure. The proposed mechanism is that the newly formed stars light-up by heating the hydrogen gas, converses enthalpy to entropy, also eventually lead to a constant decrease in the generation of new stars reach 95% of total, that reduced its actual generation to only 5%. Thus galaxies were pulled apart faster. Astronomical observation shows that galaxies clusters after acceleration at $4 \times 10^9 ly$ have has ceased to grow in number by much in the remaining to the present: $8 \times 10^9 ly$, according to the acceleration rate of the expansion by calculated for CMB applying treatment by splitting and elongation cascade.

8) Noether's theorem has guided the interpretation of symmetry in cosmology. The evolution of the universe is not time symmetric because expands without equilibrium as irreversible open in time system. According to characterization as enlarging that generates a self-closed space curvature conserving a tendency to flatness, as proposed under an inwardly open thermodynamic system. Thus, other authors assume that conservation of energy is not required. The Louis De Broglie wavelength of the particles stretches proportionally to that of light, and matter will show accordingly loss energy by a slowing down momentum. Thus, matter momentum is a function of mass or velocity or both of them.

Thus, elongation according to Doppler alone results in higher red shifts than the velocity c limit. However, an impossible event to exceed because increases mass to approach infinite values. However, the value of redshift (z) could be corrected, if taking in account photon splitting would increase concomitantly, the diameter of the universe and the distance of location of the hydrogen radiation emitting galaxies. Thus, confirming that the space pulling apart results in a measurable proportion of the photon splitting, which produce spontaneous elongation, also results in a divided angular momentum for the rotational force of galaxies and the space itself volume increment.

9) The stars show to be with lower luminosity than expected, because emitted photons became divided by the pulling apart of local space [5]. Accordingly astronomical observation show a dimmer than expected generated radiation from distant supernova. This effect is concordant with the splitting events decreasing the calculable baryonic density.

Inflation-expansion and quantum parameters

The results of a simulation by parametric down-conversion (PDC) fitted observational evidence. This data was plotted in relationship to the radius of the universe in Mpc multiplied by Hubble's constant (H_0), characterizing expansion as subject to velocity of light (c), functioning as a relativistic causality horizon.

PDC allowed describing expansion as a function of the observable increment of photon number. This one multiplied by the increment of the quantum dimensional locus (Compton-volume) equals the increment of the universe volume.

The nature and frequency of primordial energy differ by much that of its residual cosmic microwave background (CMB), but the simulation concerns only to relate their frequency by a mathematical treatment, and hereby both may be refer indistinctly.

The following theoretical treatment, of the proposed quantum and relativistic parameters, were amalgamated into a single equation and verify by simulation. The plotting of the dimensions of radius of the Universe and the radius of CMB-photon vs time of the Universe and time of localization shows that all this parameters must increment simultaneously, in order to preserve the constants.

A sequential cascade of PDC-cycles which by generating photons of lower and lowers energy could maintain "a continuum of decreasing dissipative potential", locally could relate a large decrease in enthalpy to exceed the entropy decrease as required to organize biological systems [6, 7].

Hence, because the product from a preceding PDC-cycle becomes the substrate for a subsequent

one, accumulation of product is prevented, as if were open in space, but is only open on time. The space conformation would have to be as inwardly open thermodynamic systems. This state of the system, without any considerable reversibility, is divided by parametric down-conversion of one into two CMB photons. This state would endure until is reduced by $1{,}000$ of the emitted one, to be detected by us: $2.3 \times 10^{-4}\ eV$ (or 2.725 K) energy of CMB. The continuum of lambda-CMB and its time of localization continuously generate entropy at the level of increment of photons and Compton-volume structuring the arrow of time.

There is a wide consensus in a Big-Bang [8, 9, 10], which does not start from a singularity, a non-dimensional point but still could be debated, if the generated velocity of particles, could overcame their own gravitational attraction to drive expansion. The origin could correspond to a quantum limit of very high energy density, the Planck mass.

An alternative model, could postulate a Big-Bang mechanism based in that a decrease in the energy of CMB-photons, links a decrease in their energy density to a quantum dimensional expansion in their space-time locus. A mechanism that fits a gravity-independent requirement would be the splitting of the energy of photons by a concatenated sequence of PDC processes.

The latter allows a cosmic chronology of CMB from the Era of last scattering surface to present, a change of temperature of black body emission, from $\mathrm{T} = 3{,}000\ \mathrm{K}$ to $\mathrm{T} = 2.725\ \mathrm{K}$. This corresponds to a Doppler or shift of frequency spectra of $z = 1{,}000$ over. Hence, either a wavelength elongation process or the stretching-out of space became transducers of an increment of λ into and magnification of the space-time dimensions or vice versa.

However, the relationship which is cause and which effect, becomes clearer by noticing that expansion it's coupled to an increment of $n\gamma$, which is predicted by PDC-dependent elongation and not by black energy.

The simulation results, predicts that phenomena, like the Casimir effect, which has been attributed to virtual energy, could be alternatively explained by parametric up-conversion (PUC), incrementing by two the frequency by dividing the volume by 16 to transform two photons into one.

Figure 1: Conservation of energy by PDC. *Anton Zeilinger [11] and Y.S. Lee [12] have shown that the ultra-violet laser incidence on a non-lineal crystal through the process of PDC to lower energy photons. Thus, allows each photon to be split into two of longer wavelengths. The individual photon energy became an inversely proportion of their initial wavelength, increasing the associated quantum expansion by a 16 times decreasing density and increasing the associated space volume.*

The universe has maintained an energy potential allowing expansion and life; therefore, it is still far away from equilibrium. However, if the cosmos is self-contained could not be and open thermodynamic system. This apparent contradiction was solved, by considering that the universe by photon elongation could be maintained for a long period of time, as a system away from its equilibrium.

Elongation, allows a partial recreation of a non-equilibrium potential by recycling photons, through the temporal bottleneck of the PDC process. Each PDC cycle results in less-energetic photons, which by reentering in the PDC chain, like quanta of less and less energetic content; prevent significant reversibility and product accumulation, conformed a temporal vector the arrow of time.

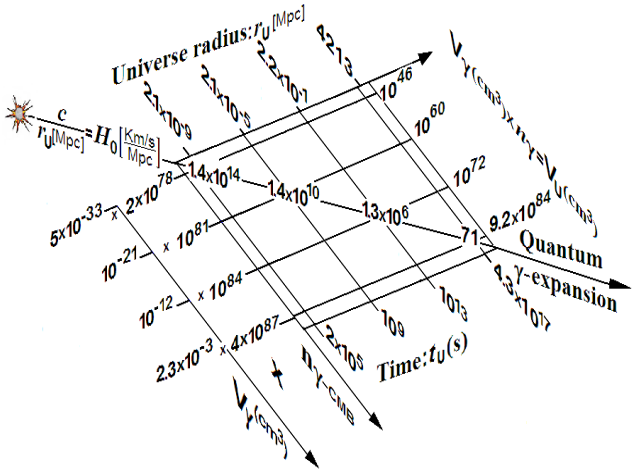


Figure 2: Observation vs. calculated Quantum Integrated Expansion. *The figure shows that the multiplication:* $\gamma \times V_\gamma = V_U$, *determines the quantum-integrated volume of the universe in* cm^3, *under the relativistic restriction: radius of the universe in cm over its elapsed time in seconds:* $r_U/t_U = c$. *If the chronological radius of the universe equals recession distance:* $r_U = \vec{r}$.. *The velocity of expansion could be measure, after the appearance of galaxies, as a recession velocity:* $\vec{v} = \vec{r}\,[Mpc] \times H_0 \rightarrow r_U \times H_0 = c$, *as shown in the figure:* $c/r_U = H_0$. *Hence,* $r_U = t_U \times c \quad \rightarrow \quad t_U \times H_0 = 1 \quad \rightarrow \quad H_0 = \frac{1}{t_U} = 3.086 \times 10^{19} km/t_U/Mpc$, $t_U\,[s]$, *example:* $H_0 = 3.086 \times 10^{19} km/4.34 \times 10^{17} s/Mpc = 71.1 km/s/Mpc$..

Volume of the universe as a function of wavelength Compton

The wavelength Compton is the smallest distance in which a particle of mass *m* can be located: $\lambda_c = \frac{h}{2\pi mc} = \frac{hc}{2\pi E} = \frac{\lambda}{2\pi}$. This work uses the concept with two restrictions. 1st, the energies of the fundamental photons are very great with energy locus very small which may allow properties to be defined as that of true particles with resting mass *m* and volume V. 2nd, mass *m* is replaced by the equivalent in energy *E* fundamental photons. With these conditions the following steps were applied.

1. The length of Compton based on the energy of the photon is: $\lambda_c = \frac{hc}{2\pi E}$

2. The energy of the photon can be represented as contained in a sphere whose diameter is the wavelength Compton λ_c. Therefore the volume of the particle Compton is: $V_c = \frac{\pi}{6}(\lambda_c)^3 = \frac{\pi}{6}\left(\frac{hc}{2\pi E}\right)^3 \Rightarrow$

Volumen Compton: $V_c = \frac{h^3 c^3}{48\pi^2 E^3}$

3. The total energy in the universe is estimated: 1.71×10^{82}MeV.

The volume of locus of energy of the particle increases as duplicates to its wavelength Compton. For an initial volume of λ_c:, by elongation is obtained $V_{c2} = \frac{\pi}{6}(2\lambda_c)^3$.

The relation is then: $\frac{V_{c2}}{V_{c1}} = 8$ the volume of locus by elongation increases of the following form $V_{c-n} = 8^n \times V_c$, where $0 < n < 50$.

If we interpreted the elongation as a continuous process implies a change of the energy of his locus. But, by the principle of conservation of the moment and the energy this process must dissipate energy in some form, that is to say, is forced to release another photon. When a photon duplicates its wavelength, its energy diminishes by half, because another photon forms with that energy. The variation of the volume produced by the process of elongation-duplication of locus is compound of two factors, increases 8 times by elongation and 2 by duplication. In summary the volume of Compton within the process elongation-duplication is expressed in the following way.

$$V_c = \overbrace{8^n \times V_c}^{Elongation} \times \overbrace{2^n}^{Multiplication} \Rightarrow V_{c-n} = 2^{4n} V_c$$

It could be shown that the evolution of volume follows a sequence according: $V_{c-n} = 2^{4n} V_P$.

The property of connectivity at the quanta level, involves the processes of elongation-duplication of particle (photon) and Planck quanta-compounding. This as was shown could be related to the overall volume changes in the universe itself. The inflationary universe from 10^{-43} to $10^{-33} s$ could be defined like the sum of the volume Compton (by elongation-duplication) and the compounding (connected) volume of the Planck in exponential interrelationship. At each level n it is necessary to multiply $V_{c-n} = 2^{4n} V_P$ by the number of compounding photons Planck until the universe has around 10 cm of diameter. Thus, avoiding an *ad hoc*

analysis, assuming a Big-Bang expansion by an inflation proceeding at much greater velocity than c.

Angular momentum and rotation of the universe

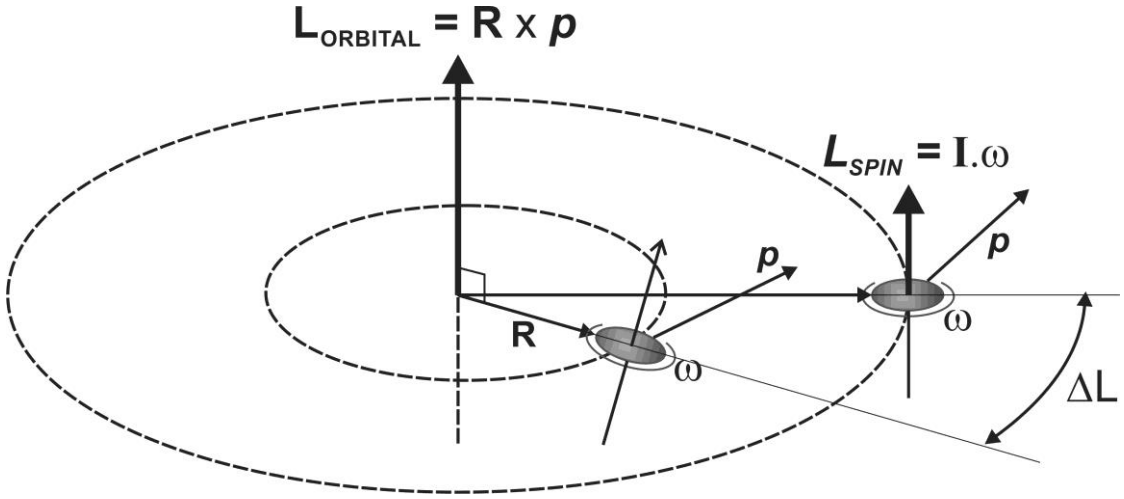


Figure 3: Angular momentum balance. *This allows a conservative total angular momentum of the universe by a feedback to restore any deviation of flatness. This regulatory mechanism, transfers angular momentum, from the voids inside for expansion of Hubble's law toward the universe frontier. The voids tend to emptiness by its enlargement progress with a cooling of the space containing hydrogen. A refrigeration feedback is expulsing the hot gas, originating by transfer of angular momentum a flow of hydrogen into the accretion disk of galaxies. This expands to halos conforming even larger volumes, but lack of observable radiation may not allow to be considered to calculate gravity.*

The sum of the angular momentum of all Planck particles is constant in the universe.

$$L_T = \sum_i L_{Planck}$$
$$L_T = \sum mvr + \sum I\omega$$

Hubble's law increases the rate of recession of galaxies, which by the linear momentum increasing distance, the inertial mass and the orbital angular momentum due to the rotation of the universe.

$$v = D.H$$

Thus, the linear momentum is increased, by increasing the distance and the inertial mass. Therefore, the orbital angular momentum increases due to the rotation of the universe.

Increase in orbital angular momentum by rotation of the Universe:

$$L_{orb} + \Delta L_{orb} = (R + \Delta R).(m + \Delta m).v$$

Decrease in angular momentum of voids:

$$\Delta L_{void} = -\Delta L_{orb}$$
$$L_{void} - \Delta L_{void} = L_{void} + \Delta L_{orb}$$

Primordial rotation of the universe

One possible explanation as to how all objects acquired the property of spin could be cosmological models which also contain a term involving the primordial spin of the universe. In homogenous and isotropic models, universe with matter may not only expand but also rotate (Gamow, 1946; Gödel, 1949; Barrow et al, 1985) (relative to local gyroscope). A general solution including the rotation is given by [8]:

$$\frac{R'^2}{R^2} - \frac{8\pi G\rho}{3} + \omega^2 = 0$$

For the last two terms to be comparable:

$$\frac{8\pi G\rho}{3} = \omega^2$$

This implies a primordial angular frequency of:

$\omega_0 = 2 \times 10^{-18} Hz$ and a corresponding time period of: $= 3 \times 10^{18} s \approx 10 T_H$, where $T_H = 10^{10}$ years is the Hubble time.

The accelerated expansion of the universe does not come into direct contradiction with relativity, since, according to the point of view we adopt, and according to the principle of equivalence (one of the bases of the GR), the gravity on the surface of a star can be assimilated at an accelerated motion, so objects far from this surface should also have an accelerated motion.

Characterization of the energy-space relationship by a Casimir effect

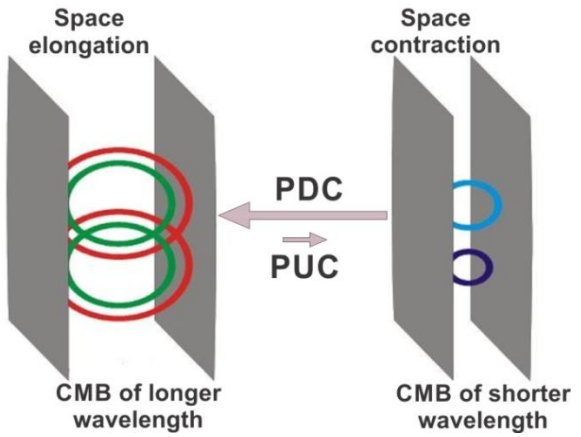


Figure 4: Illustration of photon parametric conversion. *CMB detectable of 411 photons per* cm^3*, photon overlapping within a confinement space by parametric up-conversion would allow two photons integrating to create one of shorter wavelength. This decrease in photon number and increase in photon energy density allows shrinking of the volume of photon localization. This process would be observable as an attraction between parallel plates* [13].

Hence, photon splitting was enlarging space and the resultant consequence was wavelength elongation, accounting by the space expansion, as decreasing frequency. Hence, photon splitting and wavelength elongation was a process changing enthalpy-entropy relationship and hydrogen molecular collisions resulted in the emission of a thermal radiation.

Present astronomy observation shows that after the first 100 s the initial stage for dissipation of Planck bosons of maximal density allowing to generate a universe mostly integrated by fermions state: electrons and quarks. These allow the synthesis of hydrogen atoms and for cosmological purpose of minimal quantities of helium and lithium. Thus, enthalpy has been transfer to hydrogen dispersed as a gas state before could play the role of generating an accretion disk incorporated within the gravitational field given born to emerging stars.

The interchangeable equivalence between energy of fermions in Bosons has differentiable structures. The Bosons are coupled to the voids-expansion systems and therefore are subject to evolution. The fermions are only subject to gravity.

The main-sequence stars always generate light in the same way, the nuclear fusion reactions consuming fermions (hydrogen into helium) at the star's center and emitted as a radiation spectrum (bosons) at the stars' surface.

Energy modes of confinement

The perpendicular composition of magnetic and electric field vectors inside a photon represents an alternancy of peaks distended by energy density. The photons characterize elongation and splitting along its spatial movement.

A fermion differentiating in the Pauli level of energy in a confined space could generate electrons and quarks to constitutive hydrogen. Hence, configures characteristics of *quantum* behavior distribution between Cartesian axes and also Schrödinger-boxes. The fermions (tritium or deuterium) in magnetic confinement are forced to circulate around the lines of magnetic force of a Tokamak, in the expectancy to capture the energy of fusion. Within stars the confinement is the gravitational field. Hence, since there are pathways to go from bosons and fermions and vice versa, these depend of the confinement mode.

Coupling of star energy to decrease entropy as the origin of life

The energy emitted by the sun is coupled to turning polymeric water: $(H_2O)_n$ and it is released as vapor: $H_2O_{(v)}$. At the biological level the reaction occurs at body temperature because water is taking up, by the mediating enzyme conformational changes within the membranes facing to the outside and the inside separating hydrophilic from

hydrophobic environment.

This mechanism for the origin of life is still dominant at the present chronology of the universe. It is mediated by H-bond transfer across membranes that separate an outside nutritional medium from a metabolizing one. Viruses are not an exception because the absence of an outer membrane leads to the characterization of being alive only within invaded cells.

The most obvious direct connection between solar energy and the decrease of entropy is photosynthesis [14, 15, 16, 17], which develops at latter stages of structuring cell organelles. This operates by pigment like chlorophyll capturing the light energy by a mechanism dissociating water with O_2 emission and hydrogen transfer to electron transport chains coupled to the generation of ATP, biochemical involved into the cell's internal entropy decrease.

The Jagendorf pH translocation that makes possible synthesis of ATP in the laboratory requires the membrane located ATP synthase-ATPase [18] to expose to its active site to a histidine amphoteric conformational transition response to a pH differential, separating hydrophilic from hydrophobic environments.

Human evolution for a free will

The primates' evolutionary path resulted in new differentiable connections from the automatic link of the olfactory connection with integrative responses activated by hormones, secreted in response to cerebral DNA coded genetically. In humans the olfactory bulb becomes atrophic, decreasing its functions to that of an olfactory epithelium. Therefore, humans lack during the lactation period of the autonomy shown by other mammal's species [19, 20, 21, 22, 23, 24].

Human infants could not show the mobility autonomy characterizing others species. These results into a restricted communication environment only articulate a corporal language and saliva secretions, mediating exchange of hormones. These ones reduce to partial cognitive recognition of faces and smells, mainly by exhaling the bonding hormone oxytocin [25] and the ones related to express corporal nonconformity, like adrenaline. In this way, it enables facial gestures to be related to verbal sounds through hormonal communication on the path of learning to speak.

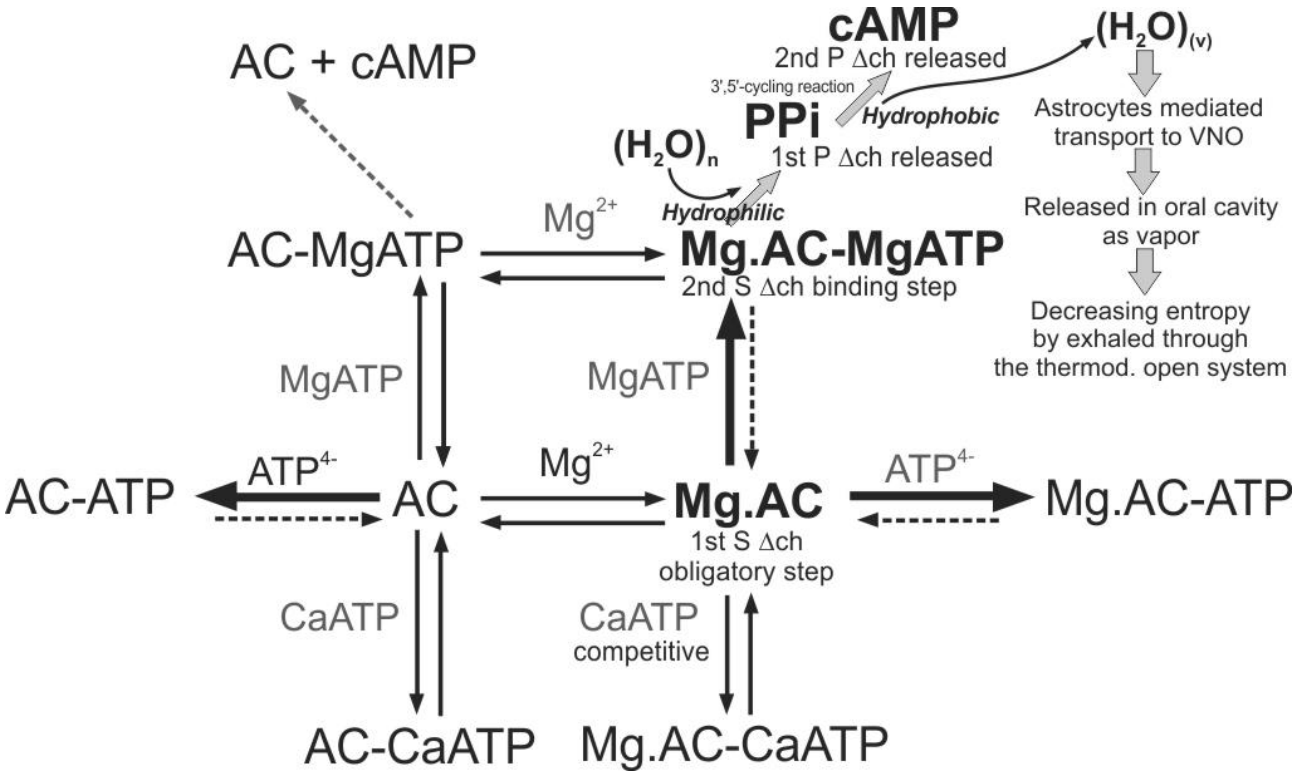
The human brain OXT-mRNA links in subcortical and temporal connections with the olfactory region for anticipatory appetite and hypothalamic areas controlling hormonal secretions pathways [26], allowing the infant response by activating it hypothalamic-pituitary-adrenal axis (HTPA) [27] to secrete hormones (like oxytocin) into its circulatory system irrigating the child's oral cavity, and discharged as a communicational response.

Hormonal receptors differentiating tissues are coupled to the adenylate cyclase (AC) activity stimulated by adrenaline [28]. The enzyme in brain neuronal membrane shows activation by noradrenaline (NA) to modulate neuronal impulse.

In a pathway that allows crossing of the membrane the orientation of the enzymes active sites, by conformational changes, could be either related from the hydrophilic sense to the capture of polymeric water: $(H_2O)_n$, and from a hydrophobic sense the release of H-bond depleted H_2O_{vapor}. These ones isolated molecules, in which do not evaporate, because could maintain dipolar attraction, under circulation as cerebrospinal fluid (CSF) within the astrocyte and capillarity to eventually reach the vomeronasal organ (VNO).

Thus, the cell membrane properties [28, 29] allow a unique space-time location, where at a greater enthalpy expenditure produce a reversal of entropy, functional for life. This one cycle is coupled to a water cycle for H-bond transfer, driving the turnover of conformational changes of proteins [30, 31] that allows ion exchanges for acting the action potential (scheme 1).

Hence, the evolution allows to locate hormone receptors to couple neurotransmission to activate AC by an excess of Mg^{2+} over ATP, into cyclic AMP (cAMP) for irreversibility operating like an open system. This one functions physiologically to activate the opening of a double helix DNA, to insert a Mg^{2+} coordinated cAMP for transitory reading of the DNA sequence that initiates cerebral circuits. The opening could close by subtracting of the $Mg^{2+}$by ATP^{4-}. A technical procedure allows the separation of the two chains by heating at 65^oC.



Scheme 1: RARE BiBi (2 substrates and 2 products) ordered binding (macro mechanism) of adenylate cyclase including ATP^{4-} and CaATP as dead-end inhibitors. *The test tube measurement by applying the initial rate studies corresponds to the BiBi:* $S_1 = Mg^{2+}$, $S_2 = MgATP$, $P_1 = PPi$ *(pyrophosphate),* $P_2 = cAMP$ $(3',5'-cyclic\ adenosine\ monophosphate)$, $E = AC$, $\Delta ch = conformational\ change$, *VNO (vomeronasal organ).*
Esquema 1: RARE BiBi (2 sustratos y 2 productos)

The scheme shows the regulatory equilibrium with activator excess of Mg^{2+} over ATP^{4-} and inhibition by the excess of ATP^{4-} over Mg^{2+}. The signaling for homeostatic Ca^{2+}release controls neurotransmitter synthesis and release, neuronal excitability, phosphorylation and overall involvement in long-term processes, like memory.

The active site of AC conform a change (Δch) facing the CSF, a hydric environment, containing a 55.5 molar concentration of polymeric water: $(H_2O)_n$ entering the active site of the enzyme to release the first product (1st P), pyrophosphate (PPi). The cycling steps reaction release of the second product (2nd P), cAMP, allows the release of $H_2O_{(v)}$. Therefore, the latter shows an exhausted state of H-bonds but still is capable to show polar attractions, could be carried in a liquid state, through the astrocytes transport system to be exhaled as a 5% vapor by the oral cavity.

The cAMP assay at test tube experimental level shows the equilibrium characterized as a RARE BiBi mechanism (scheme 1), and results a coupling of the water cycle in a relation of 55.5 molar substrate $(H_2O)_n$ to the very low concentration that could be assumed to be in the order of micro molar product accumulated product $H_2O_{(v)}$. This relation $\Delta G \approx -2.3\ log\ \frac{[H_2O_{(v)}]}{[(H_2O)_n]}$ tends to a very high mass action by the $[(H_2O)_n]$. However, total irreversibility confers to the cycle a tendency to operate by releasing water $((H_2O)_v)$ out of the system.

Hence, any uncoupling of the water cycle will make impossible to maintain alive the brain even for a few seconds. On the other hands allows for humans a highly autonomous brain that through the hypothalamus control of the body level of glandular system denies any regulatory feedback by a blood-brain-barrier (BBB) to glucagon and adrenaline [32] could not pass through it. Thus, preventing regulatory feedbacks by other tissues and allowing the brain to exhaust their energy resources.

The cAMP for intracellular signal transduction, controls hormonal mediated metabolic responses. Hence, the catecholamine effect is mediated in brain by NA activated AC. The cAMP is activated by a Gs-protein-coupled receptor at the postsynaptic membrane in connection with a neurotransmitter (first messenger) that is released at a synapse to the axonal ending of this neuron [33]. cAMP in turn activates protein kinase A (PKA). The latter enzyme leads to a facilitation of neurotransmitter release from the axonal ending of this neuron (sensitization), and configures short-term memory.

As regards long-term memory, PKA in the nucleus of the same neuron activates CREB protein as transcription factor that binds to a certain DNA sequence and thus increases the transcription of certain CREgenes. The human brain OXT-mRNA links in subcortical, temporal connections and allowing cAMP to bind to protein kinase A and activates it, allowing PKA to phosphorylate downstream factors to produce a cellular response. cAMP signaling is turned off by the enzyme phosphodiesterase, which breaks the cAMP ring and produces adenosine monophosphate (AMP). Cyclic AMP-response element-binding (CREB) protein is phosphorylated on Ser-121 [34].

Circulating cell-free fetal DNA (cffDNA) are degraded DNA fragments released to the blood plasma, circulate originates from cells shed from placental trophoblasts microparticles. This disappears after two hours from delivery, adequate sex-dependent aspects of parenting.

Prenatal diagnosis targets on the cffDNA analysis show correspondence with the gene responsible for the sex-determining region Y protein (SRY) on the Y chromosome and the DYS 14 sequence [35, 36].

There is evidence that cell-free DNA (cfDNA) becomes increasingly frequent in circulation with the onset of age. cfDNA is mostly a double-stranded extracellular molecule of DNA, consisting of small fragments (50 to 200 bp) [37, 38] and larger fragments (21 kb).

Implicit memory (procedural memory) refers to the use of objects or movements of the body, such as how exactly to use a pencil, drive a car, or ride a bicycle. This type of memory is encoded and it is presumed stored by the striatum and other parts of the basal ganglia. The basal ganglia is believed to mediate procedural memory and other brain structures and is largely independent of the hippocampus [39]. Research by Manelis, Hanson, and Hanson (2011) found that the reactivation of the parietal and occipital regions was associated with implicit memory [40].

CREB Regulates Memory Allocation in the Insular Cortex, by the double helix opening by coordinative binding by $Mg^{2+} - cAMP$. CREB, in addition to synaptic plasticity, also modulates the intrinsic excitability of the neuron, for new connections between intrinsic and synaptic plasticity in understanding of the role of CREB in memory formation [41].

Amygdala neurons with higher levels of the cyclic-AMP-response-element-binding protein (CREB) are more likely to be recruited into encoding and storing fear memory [42]. That CREB levels determine which insular cortical neurons will encode memory for conditioned taste, within neuronal circuits interconnected with conductance behavior.

NA-AC produces the cAMP, which to control of ion channels, integrated by membrane proteins function for voltage-gated cation channels in the plasma membranes of brain cells. These could encode the electro-membrane fluctuations of hearing language transfer of emotions to locate at specific neuronal circuits activating the childhood's working memory.

Locus coeruleus (LC) very long axons allow to correlate specific location like hearing, oral, touching domain to create sceneries with emotional memory, for events that evoke a particularly strong emotion, which can involve both declarative (language) and procedural mobility response processes. Emotional memories are consciously available, but elicit a powerful, unconscious physiological reaction requiring psychoanalytic treatment.

Emotional situations activate amygdala, the hippocampus and prefrontal cortex in the encoding and consolidation of cognitive memory. Working memory is not part of long-term memory, but is important for long-term memory to function; holds and manipulates information for a short period of time, before it is either forgotten or encoded into long-term memory.

The GABA pathway

Mother's milk contains glutamate and calcium that allows during infant brain development, propitiating the sleeping periods. Thus, the lactation period the synaptogenesis during brain development to bypass and reorganize neuronal connections and its receptors controls the release of calcium. Sleep is an important factor in establishing well-organized long-term memories. Glutamate and gamma-aminobutyric acid (GABA) are the major neurotransmitters in the mammalian brain. The metabotropic families are G protein-coupled receptors, operating a second messenger system for long-term memory acquisition.

Family: metabotropic group I modulatory control of $Na^{+}$and K^{+} inflow and outflow for maintaining the action potential across the membrane.

Family: NMDA, type: ionotropic, voltage gated, mechanism: increase membrane permeability for calcium

Family: metabotropic group II and Group III, type: Gi/G0-coupled, mechanisms: inhibiting adenylate cyclase and decreasing intracellular levels of cAMP.

Glutamate works not only as a point-to-point transmitter, but also through spill-over synaptic crosstalk between synapses in which summation of glutamate released from a neighboring synapse creates extrasynaptic signaling/volume transmission. The GABA receptors participate in connectional organization, transversal in females and perpendicular in males.

The organization of the relation between short- and long-term memories

This re-organization conforms to evolutionary finalities to bypass the more animalistic integrative role of the olfactory function by the primate's vision, touch and audit senses. The atrophy of the olfactory centrality yields evolutionary advantages to the human brain evolution [43].

Thus, like allowing learning experiences to be inter-connected by neuronal pathways affording higher level cognition. Accordingly, individuals would be able to manipulate differentiable languages, cultural diversity and social adaptation, like differentiable professional roles.

All of these manifestations of free will do allow the acceptance or rejection, by balancing the available social options to be taken by mentally differentiated members of the human species.

Discussion

The European Space Agency is building the Euclid telescope. Due to launch in 2020, it will map galaxies up to 10 billion light years away. By seeing how entropy influences, which many by not yet defining attribute has denominated dark. This expanding energy shows arrangement and shape that the mission will allow scientists to see if the strength changes allow its characterization. If the pulling apart not yet characterize energy is found to vary throughout time it would indicate it is due to quintessence, where observed acceleration could be due to the energy of a scalar field of photon splitting and elongation, supporting the thermal radiation *quantum* role into the *voids* equivalent to cosmological constant effect. CMB allows to observe the universe as it was at age 3.8×10^{5} light-years (ly), which shows a highly uniform distribution of matter (hydrogen) after dissipating only a mass equivalent to 0.005% as black body thermal radiation.

No evidence of quintessence is yet available, but it has not been ruled out either. It generally predicts a slightly slower acceleration of the expansion of the universe than the cosmological constant. Some scientists think that the best evidence for quintessence would come from violations of Einstein's equivalence principle and variation of the fundamental constants in space or time [44]. Scalar fields are predicted by the Standard Model of particle physics and string theory, but an analogous problem to the cosmological constant problem (or the problem of constructing models of cosmological inflation) occurs: renormalization theory predicts that scalar fields should acquire large masses again due to zero-point energy.

The speed of the expansion increases as a function of the splitting of photons potentiating elongation. Non-lineal three axes of some crystals allow a photon splitting effect by projecting laterally at separating the angle of the course of light. At the cosmological level the process became associated to

the space-time emergence of gravitational waves [45] with a radial pattern of polarization created by expansion. This effect is associated to the emission by the shaking space of oscillations, during the separation of the strong, electroweak, and electromagnetic forces. Thus, the emitted gravitational wave shows a screw motion delimiting sidedness, a handedness process allowing photon propagation with either a right- or left-handed orientation.

The CMB polarization resulted from the highly elongated gravitational waves impacting the plasma state at the time, preceding the last scattering surface, transparency acquired by the expanding space. The dense plasma could not have produced by itself, the forces producing handedness. Therefore, the highly elongated gravitational waves by striking the electrons within the plasma produce CMB polarization. Hence, this provides a solution that could turn-down the alleged inflationary event. The latter proposition was *ad hoc* assigning a non-credible highly increases of the velocity of light. This treatment was developing to conciliate the large homogeneity observed in the CMB map. The proposition of the surging in space of the Planck bosons does not need to provide the *ad hoc* requirement of a larger c to create a connection between different regions of the universe because that exists by the sharing of bosons of the same quantum state.

The mathematical treatment considers a total energy 8×10^{60} Planck bosons in dissipative state and $1.22 \times 10^{22} MeV$ per photon at the initial state.

The splitting of photons is assumed to be link as a thermodynamic-quantum event of the expansionary time cycle. This is dependent of the doubling of the universe radius by scaling the universe chronology through about 107 stages, which allows calculate the volume of the universe in a function of the dissipative decay of its energy density and entropy accumulation.

Hence, during the time elapsed from $5 \times 10^{-43} s$ to $10^{-36} s$ the scaling by each splitting replicated in 16 times increment in volume per doubling by elongation of cosmic radius occurs very rapidly for the universe volume but does not affect c.

The potential for entropy accumulation has to match the potential of enthalpy dissipation in order to maintain flatness curvature.

The equation could reflect that $\Delta\rho$ decreases stretching photons, but is potentiated by the splitting increasing the theoretical number, corresponding to an process extending in the present as a statistical dispersion of the individual photon splitting event. The overall duplication of the radius corresponds with the time involved in the universe acquiring a volume 16 times greater, but not exceeding c during this scaling level of incrementing quantum cycles.

Einstein's role predicted for a cosmological constant as an operator for expansion, is fulfilled by the thermal radiation, which does not responds to gravitation but has inertial response enlarging *voids*, because is in opposition to starlight that does have a gravitational response.

Thermal radiation could be characterized as entropy, because expands in space as a recoil to the direction of the Hubble's law expanding space in opposite direction and decreasing density, allow the loss of coherence by increasing randomness effects. Moreover the matter surrounding stars not only reflects starlight but also could be absorbed to be emitted as a black body thermal radiation, similarly to CMB.

Expansion shows irreversibility stages: Planck bosons → quark-gluon plasma → Bose-Einstein condensate-21-cm radiation → thermal radiation located in voids or emitted by black holes (entropy, hide curvature) ↔ hydrogen stars/galaxies (enthalpy, gravitation) that appears as evolution stages uniformly along the universe. Accordingly, uniformity is the projection of the identical *quantum* state predicted for Planck bosons.

The cosmological constant may predict that rather of a force opposed to gravity may appear thermal radiation ignoring it and still supporting flatness. In this case a decreasing curvature in the universe would be coupled to the increase of entropy and decrease of enthalpy, with the constant dissipation of matter by photon emission. The star's redshift and photon elongation configures Hubble's law data. This one will reflect a bottleneck effect, required to maintain over time the critical density.

To describe this bottleneck effect in random

state as a probability function to conserve the density distribution, leads to very large number, but conservation of the uniformity avoids such conclusion.

Curiously, this observation is in accord with a prediction made by physicist in 1987, by Steven Weinberg's conjecture: the cosmological constant must be zero to within one part in roughly 10^{120}, or else the universe either would have dispersed too fast for stars and galaxies to have formed, or would have recollapsed upon itself long ago.

Conclusions

The primordial universe was organized not by coincidences. But, by thermodynamics treatment that allows to apply non-equilibrium state of the universe as required by an open state. Thus, the open system satisfies its irreversible nature. This one operates by a bottleneck maintaining a constant rate for the dissipative state or flatness. An inwardly open system allows a self-contained universe.

Voids density is maintained constant by cooling enlarging maintaining a constant output, displacing the hydrogen contained from *voids*. The emergence of dissipating Planck bosons occurs with kinetic transfer of angular momentum. Thus, hydrogen moves into acreation halos of large volume and high density, at low temperature does not is easily astronomical detectable, feeding the process of star creation. The thermal radiation when the Hubble distancing confers to space spontaneous angular momentum at splitting angles, a statistical effect reinforcing its pressuring over galactic contours, showing momentum of similarly effect to an unobservable energy, which could not be characterized and because of that is denominated dark energy.

The Planck bosons define the maximal theoretical density of energy, which is organized by a same quantum state. This configures a simultaneous emergence characterizing the Big-Bang Era. A latter stage ending at 100 seconds is dominated by the external projection gravitational waves that at c velocity, which stretch out with a torque alternating opposite senses and its incident at the plasma stage transfer vibrational effect, detected by Baryon Oscillation Spectroscopic Survey (eBOSS).

This model allows a ratio of the number of hydrogen to helium atoms. The CMB thermal radiation originated by thermic collision was detected at $3.8 \times 10^5 ly$ showed a rather uniform initial stage composed of two types of elementary particles: quarks and leptons. Only after $5 \times 10^8 ly$ emerging of the stars, by fusion of hydrogen to helium produced a radiation spectrum, responding to gravity.

The lookback on time allows to detect the hydrogen aggregation in the primordial stars and galaxies from a significant number of galaxies the observer can project the Hubble's constant. This allows a projection to initial critical density in the base an expansion parameter in which the density within voids decrease constantly. The density of matter decreases proportionally to the volume reached and the density radiation is obtained in proportion to the increment of *void* volume and the wavelength elongation of radiation spectrum.

The density of matter in the universe calculated from total Planck energy as hydrogen has decreased to the actual density by the volume increase of the observable diameter of the universe: $8.7 \times 10^{28}\, cm$. Thus, a pressure feedback expulsing hot hydrogen gas, during expansion, feeding the gravitational attractions by galaxies and black holes.

The expansion during uncoupling of forces was coupled to the outward emission of gravitational waves, enveloping the primordial universe by its screw motion, which shows angular momentum laterally distending space in opposite directions. Thus, could be inferred shaping an external hyperbolic curvature and internal space maintaining the critical density. This shapes the expanding universe by photon division into two of ½ density, half frequency and a concomitant distending space. The spherical radial elongation by 2 and multiplication of each photon by 8 for volume increment yields a 16 times scaling cascade cycles of the surging space.

Consequently, decreases rapidly the frequency of the gravitational waves, maintaining c velocity, and a factor potentiating the enlargement of the space. The associated sound decays in frequency but extends to about the first 100 seconds. Its propagation over the plasma state by its polarized

pattern of its screw motion produces swirls conservation of angular momentum, which could eventually surge into the spiral motion of galaxies.

A mathematical treatment applying Fourier analysis of the curls patterns resulted into measurements of CMB polarization and determined the amplitude of the highly decreased frequency of the stretched gravitational waves, which propitiate collision of electrons with an emission of CMB photons.

Hence, expansion naturally overcoming inflation, which has an *ad hoc* solution by exceeding the velocity limit of c. Velocity of light has to play the role of bottleneck, limiting the flow of matter and energy into dimensioning expansion by the critical tendency to maintain flatness curvature.

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