

Null and zero: What does algebra tell us about physics, the universe, and everything?

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Abstract

The universe is considered to be a logical system amenable to description in terms of dimensionless physically meaningful quantities united by common algebraic relationships. This insight allows us to reveal that: (i) time and space are interrelated via a certain causal order; (ii) this order arises via self-organization of void underlying the quantum structure of time-space; (iii) the corresponding symmetry and conservation law are manifest in the principles of causality, least time and least action; (iv) the causal relationship between void, time and space is amenable to analytical description in terms of a basic scale invariance of the universe.

Keywords: asymmetry, symmetry; causality, entropy; gravity, information; time, space

1. Introduction

The paper argues that the structure of time-space can be described in terms of dimensionless physically meaningful quantities united by common algebraic relationships arising from the scale invariance of the universe—the radius of a void particle. Obviously, this claim immediately confronts us with the idea of an originary numeric nature to the world order; in principle, this insight is not antithetical to scientific reasoning, though the suggestion, of course, is foreign to contemporary physics, which is primarily dimensional and basically mechanistic.

The point is that physics traditionally investigates nature through the external order, which is manifest, first and foremost, in mechanical motion; therefore, physicists give epistemic priority to the principle of least action, considering it to be a factor of paramount importance. Though solidly grounded, this approach alone has no chance of achieving the logical completeness required for a final physical theory. In what follows, the paper reveals the reason for this: it is causality, but not action, that lies at the foundation of the spacetime explored by physics. In contrast with tradition, the construct that is suggested here gives priority to causality, which, as the research reveals, is manifest in certain symmetries thus explaining why the corresponding conservation laws hold true. Obviously, this suggestion implies the priority of causal information over matter, which, conceptually speaking, turns theoretical physics inside out; however, the research to be presented is not so much about affirming the primacy of information over matter as it is about exploring their relationship to one another.

Speaking in more general epistemic terms, the paper hopes to make it clear that no fundamental physical challenge can be consistently addressed without reference to ontological reasoning. It is precisely such insight that has allowed us to bring physics and ontology to their common epistemic root: once regimented according to a logic that is considered to be favoured by nature, and endowed with an appropriate mathematical skeleton, these two branches of natural philosophy fit perfectly together to address some of the long-standing challenges of physics.

2. Structure of the paper

The structure of the paper can be given in terms of the major issues to be considered. At the outset, the paper introduces an algebraic relation which pieces together the fundamental constants of nature via the point of equilibrium of the universe. Further investigation reveals that this point is of fundamental importance to the structure of time-space, which, algebraically, can be described as a dual system consisting of two symmetrically inverted entities marked with conjugated physical properties. This entails appropriate relationships describing a quantum gravity loop underlying fundamental interactions; algebraically described, this loop provides us with an insight into the way in which gravity, entropy, time, space and mass are related to each other. Given this insight, we are able to claim that gravity is discrete quantum information, which, first, determines the distribution of matter over the time-space continuum, and, secondly, establishes the principles of both its dynamics and conservation. A crucial methodological point of the research is that it distinguishes between the mathematical (null-based) and physical (zero-based) concepts of the conservation of time-space (the former refers to the absolute symmetric behaviour which never occurs in reality while the latter describes asymmetric behaviour of quantum objects which is manifest in physical reality around us). Considered in their totality, these two concepts allow us to explore nature in a way that may be considered to be logically complete; on the basis of this claim it becomes possible to reveal the epistemic roots of certain conceptual difficulties faced by current physics, and therefore to offer solutions to some of its long-standing challenges.

3. Equation of equilibrium

Today, the global tendency in exploring the nature of time-space is for physicists to seek for appropriate clues not so much in the initial state of the universe as in the structure of the physical laws governing the universe of today. The reason for this is plain: there is no physical footing for appropriate concepts in the very early universe—to say nothing about a pre-time state of the universe. The construct suggested here draws, conceptually, on a combination of algebraic and ontological insights, which are considered capable of filling the epistemic gap outlined.

The model to be proposed allows us to bridge the initial and boundary states of the universe via the point of equilibrium, which connects the fundamental constants of nature as follows:

$$(x) \cdot (e^{x^{-1}}) \cdot (x \cdot e^{x^{-1}}) = T_w \cdot G_w \cdot F_w = \Omega \quad (1)$$

where $x = \alpha_w$ is considered to be the time-rate of the electron at the point of equilibrium (also referred to as the absolute constant of time, T_w); note that its value ($\alpha_w \approx 7.29739 \dots \cdot 10^{-3}$) is remarkably close to the currently accepted value of the fine structure constant ($\alpha \approx 7.29735 \dots \cdot 10^{-3}$).

$G_w = e^{x^{-1}}$ is considered to be the absolute constant of gravity, to be related to the point of equilibrium $G_w \approx 3.266 \dots \cdot 10^{59}$.

$F_w = x \cdot e^{x^{-1}}$ is considered to be the absolute constant of the universal force (electro-magnetic and nuclear forces considered as a single force); equivalently, this is the radius of the universe corresponding to the point of equilibrium $R_w = F_w \approx 2.383 \dots \cdot 10^{57}$.

$\Omega = R_w^2 = x^2 \cdot e^{2x^{-1}} = 10 \cdot \omega \cdot 10^{114}$ is considered to be the absolute age of the universe, that is, the duration in which the universe passed from its unique initial state to its unique boundary state.

$\omega = W(1) \approx 0.567 \dots$ is the omega-constant; W is the Lambert function defined as the function that solves the equation $z = W(z) \cdot e^{W(z)}$, where z is a complex number (throughout this paper, z indicates a complex variable, x a real one).

It is natural to ask: Where did Eq. 1 come from? Epistemologically, it derives from the Dirac large numbers hypothesis. Given this hypothesis, the paper assumes that the five fundamental physical constants (Newton's constant, G , light speed, c , Planck's constant, \hbar , the electron mass, m , and the electron charge, e) can yield only two physically meaningful dimensionless relations; one of them is the fine structure constant ($\alpha = e^2 / \hbar \cdot c$) while the other is a typical 'large number', which can be written as follows: $\xi = \hbar \cdot c / G \cdot m^2$. A crucial hint concerning these two numbers was given by Arkadiy Migdal; though the physical sense of this 'large number' was then completely uncertain, this physicist assumed that the state of equilibrium of the universe might somehow be connected with the following relation: $\alpha \cdot \ln \xi \sim 1$ [9, p. 184]. It is precisely this assumption that underlies one of the central premises of the present research: the micro- and macro-states of the universe are interconnected through the quantity which the paper refers to as the time-rate of the electron (α_w). Here, a possible confusion concerning the fine structure constant should be removed; commonly, this constant is interpreted as a quantity which connects the strength of the electro-magnetic forces with that of the nuclear ones as applied to the hydrogen atom; this reveals one aspect of the alpha, while the other one is that this 'constant' is a changeable quantity: the paper claims, and in what follows it gives reasons for this claim, that the fine structure constant (α) has a larger value at the point of equilibrium (α_w). Thus, the introduction of α_w implies that the paper manifestly distinguishes between the two conceptually different approaches to the same physical footing.

The absolute constants indicate the absolute scale described in terms of exponential dependency correlated with high-energy macro-states of the universe; appropriate microscopic objects are described in terms of the elementary units, which are fully inversed against the absolute ones (the elementary scale is described in terms of logarithmic dependency correlated with low-energy micro-states of the universe). Accordingly, the elementary units of time, mass, and length are defined as follows: $t_w = \ln^{-1} \Omega$, $m_w = \ln^{-1} G_w$, $l_w = \ln^{-1} R_w$, respectively (in what follows, upper-case letters denote the absolute scale while lower-case ones denote the elementary scale); thus, the unit of length is considered to be the elementary measure of the radius of the universe corresponding to the point of equilibrium; the unit of mass is considered to be the elementary measure of gravity corresponding to the point of equilibrium; and the unit of time is considered to be the elementary measure of the absolute age of the universe. Obviously, the absolute constants and their elementary derivatives are universal by definition: they are same for all times and for all observers in the universe; they do not depend on the relative positions or speeds of observers; and they are dimensionless in the sense of their being *number*, which defines the most fundamental level of existence and provides the most general analysis of any system, irrespective of its particular elements and the nature of their interconnections. The attentive reader will probably have already noticed that, in terms of algebra, the time-rate and the mass of the electron at the point of equilibrium are indistinguishable ($\alpha_w = m_w$), thus presenting two physically meaningful algebraic equivalents. It is exactly this condition that allows us to

deduce the analytical relation between the time-rates and masses of quantum objects, as briefly discussed below.

4. Equation of time-space

Formally, the algebraic relation between two values (say, α_w and ω) can be written as follows: $\alpha_w \cdot \omega / \alpha_w = \omega = \alpha_w \cdot \omega / \alpha_w$. One who sees perfect symmetry between the numbers ω and e ($\omega \cdot e^\omega = 1 = \omega^n \cdot e^{n\omega}$, where n is an integer) can express the parity of the time-rate and the mass of the electron as follows:

$$\alpha_w \cdot \omega / T_w \cdot e^{\alpha_w \cdot \omega / m_w} = 1 = \alpha_w \cdot \omega / m_w \cdot e^{\alpha_w \cdot \omega / T_w} \quad (2)$$

where T_w is the time-rate, and m_w is the mass of the electron, $T_w = \alpha_w = m_w$; the mid-part of Eq. 2 *exactly* equals the radius of the electron at the absolute scale, $R_e = 1$. Here, we should pause to clarify the line of reasoning underpinning this deduction, and those that are to follow. It is assumed that the point of equilibrium corresponds to the boundary state of the universe at which the absolute constants reach their unique ('canonical') maximums. Therefore, the speed of light at the absolute scale is considered to be as follows: $c = F_w$ (its elementary derivative is defined as follows: $v = l_w / t_w \approx 2.000264 \dots$ further referred to as ≈ 2 , which is a classical representation of velocity of a material body moving in Euclidean space); the same line of reasoning also allows us to define the (absolute) quantum of action as the unique boundary maximum of the universal force, that is, as F_w . Given the above, the sought-for radius can be deduced from the formulae of current physics as follows: $r = \alpha \cdot \lambda$, where $\lambda = \hbar / m v$, which immediately yields $R_e = \alpha_w \cdot \alpha_w^{-1} = 1$, assuming $v = c = F_w$, $\alpha = \alpha_w$, $m = \alpha_w$, and $\hbar = F_w$.

The principle of analogy, perhaps the most powerful tool of analysis, allows us to extend Eq. 2 into the field of other elementary particles, so from Eq. 2 it follows that the time-rate and mass of any elementary particle univocally define its radius. Given the parity of reasoning, Eq. 2 can be rewritten as follows:

$$\alpha_w \cdot \omega / T_p \cdot e^{\alpha_w \cdot \omega / m_p} = R_p = \alpha_w \cdot \omega / m_p \cdot e^{\alpha_w \cdot \omega / T_p} \quad (3)$$

where T_p , m_p , and R_p are, respectively, the time-rate, mass, and radius of a given elementary particle (p).

5. Two sides of the universe

Given Eq. 3, one can calculate the time-rates and radii corresponding to the unique masses of separate particles by substitution into Eq. 3 of appropriate values given in units of electron-masses; as it follows from these calculations, each algebraic value corresponding to unique mass has two real roots, so, algebraically speaking, each quantum object can be described as a dual quantity having two time-rates and two radii; thus, the space of quantum objects (elementary

particles) can be described as an algebraic system consisting of two complementary realms interconnected through the electron joint ($R_e = 1$), as Table 1 shows.

Table 1. Time-rates (T_p) and radii (R_p) of four selected elementary particles (R_e and r_e are electron radii at the absolute and elementary scales, respectively).

Particle	T_p	R_p	T_p^D	R_p^D
...		
Dark-proton			$\approx 0.00039\dots$	$\approx 10.43\dots$
Dark-pion			$\approx 0.00049\dots$	$\approx 8.59\dots$
Dark-gamma-quantum			$\approx 0.00055\dots$	$\approx 7.67\dots$
Electron (e) and its dark-twin	$= \alpha_w$	$= 1 (R_e)$	$\approx 0.00256\dots$	$\approx 2.84\dots$
Gamma-quantum (γ)	$\approx 1\dots$	$\approx 0.00414\dots (2r_e)$		
Pion (π^+)	$\approx 2\dots$	$\approx 0.00207\dots (r_e)$		
Proton (p^+)	$\approx 13.4\dots$	$\approx 0.000309\dots$		
...		

Thus, Eq. 3 describes a dual symmetrically inverted pattern organized in such a way that for every quantum object its time-rate increases as radius decreases in one realm while in the other realm the time-rate decreases as radius increases, so, theoretically, an action in one realm consequently induces an appropriate counter-action in the other realm, in such a way that the two realms can unceasingly induce each other through the common centre of symmetry defined by the point of equilibrium. Step by step, physics has explored the quantum luminous realm (left lower part of Table 1), while the inverse realm remains a dark side of the universe amenable only to speculation and crude approximation; as the model assumes, it is exactly here that algebra, literally meaning ‘restoring’ and ‘forcing’, bears the potential to explain how these realms are interrelated, and it is precisely this algebraic insight that lies at the heart of the research to be presented.

Next, it would be useful to show how this dimensionless pattern might be connected with the dimensionality inherent in physics. In principle, if the Compton wavelength of an elementary particle is known, one can calculate a dimensional radius-equivalent for this particle as follows: $r_p = \lambda_p \cdot T_p \cdot R_p$, where the right-hand terms are, respectively, the Compton wavelength (dimensional), time-rate, and radius of a given particle (dimensionless). For example, drawing on the data presented in Table 1 and the physical values obtained through empirical research [7,10], one can calculate dimensional radius-equivalents, for example, for proton $\approx 0.842 \dots / 1000$ fm, pion $\approx 0.585 \dots / 100$ fm... electron $\approx 2.818 / 1$ fm... anyone capable of multiplying can continue making up this set (the calculation is obviously crude, but taking into account its illustrative purpose the outcome can be considered relevant to the empirical data; of course, the scale coefficient of the universe, a *factor of ten*, should be taken into account).

6. Fundamental interactions

Equations 1–3 describe the universe at the point of equilibrium, that is, in the state of its complete coincidence with itself, which can be reached through a series of identity transformations: in terms of algebra, this corresponds to the process of approaching self-similarity (self-identity). Self-similarity of a unique specimen (say, R_w) can be written formally

as follows: $R_w^{-1} \cdot R_w = 1$, where R_w is the radius of the universe (equivalently, the quantum of action, F_w), which marks the strength of the universal force at the point of equilibrium; therefore, its inverse value (R_w^{-1}) can be considered to be the smallest spatial measure of the universe, equivalently, the shortest wavelength contributing to the ‘zero-point energy’; in what follows, this quantity will be referred to as the radius of the void particle $|r_0| = (|\sqrt{10\omega}|)^{-1} \cdot 10^{-57}$. Now, given the formulae of current physics, it is possible to deduce some dimensionless quantities of the electron (Table 2).

Table 2. Dimensionless quantities of the electron.

Quantity	Absolute	Elementary	Source formula
Quantum of action (F_w, \hbar_w)	$\alpha_w G_w$	$\alpha_w \omega$	See below
Classical radius (R_e, r_e)	1	$\approx \hbar_w/2$	$r = \lambda\alpha$
Gravitational radius (R_g, r_g)	2	$\approx \hbar_w/2$	$R_g = 2Gm/v^2$
Bohr radius (A_0, a_0)	α_w^{-2}	$\approx \alpha_w^{-1} \cdot \frac{1}{2}\omega$	$a_0 = \hbar/mc\alpha$
Compton wavelength (Λ_w, λ_w)	α_w^{-1}	$\approx \frac{1}{2}\omega$	$\lambda = \hbar/mv$
Charge (E_w, e_w)	$\pm\sqrt{\Omega\alpha_w}$	$\approx \pm\sqrt{2\alpha_w^2\omega}$	$\hbar = e^2/\alpha v$
Energy (U_w, u_w)	$\approx \frac{1}{2}\Omega\alpha_w$	$\approx 2\alpha_w$	$U_e = e^2/2r$ $E = mv^2/2$
Angular momentum (for a circular Bohr’s orbit, L_e, l_e)	G_w	ω	$L_e = mva_0$
Ratio 1: quantum of action to angular momentum	α_w	α_w	
Ratio 2: classical radius to Compton wavelength	α_w	α_w	

Next, we set out the rationale which underpins the following assumption: $\hbar_w = \alpha_w \cdot \omega$, where \hbar_w is considered to be the dimensionless (elementary) analog of the reduced Planck’s constant (only reduced forms of physical quantities are considered in this paper; the rationale behind this restriction is that the paper focuses on the end-points of evolution of the universe rather than on its unwinding nature). Given that α_w is the reciprocal of the Compton wavelength of the electron, the paper considers α_w to be a frequency-like quantity related to the electron while ω accounts for the spatial invariance of the whole quantum flow. The above allows us to set up a one-to-one correspondence between individuated ($\propto T_p$) *discrete* values of the quantum of action and every elementary object of the *continuous* quantum vortex. Therefore, the elementary quantum of action can be defined as $\hbar_p = T_p \cdot \omega$ (note that this definition allows us to quantify the amount of electron quanta to be related to the point of equilibrium as follows: $N_w = F_w \cdot \hbar_w^{-1} = G_w \cdot \omega^{-1} \approx 5.75 \dots \cdot 10^{59}$). The two ratios (lower part of Table 2) are highlighted merely to stress the outstanding role of the alpha in connecting the absolute and elementary quanta of action of the electron, which is as follows: $F_w/G_w = \alpha_w = \hbar_w/\omega$ (reciprocally, $\hbar_w/\alpha_w = \omega = \hbar_w/m_w$). Note that the gravitational radius of the electron is deduced from the following substitutions in Schwarzschild’s equation: $G = G_w, m = \alpha_w, v^2 = F_w$ (the absolute scale) and $G = \omega, m = \alpha_w, v^2 = 4$ (the elementary scale), respectively.

Commonly, physical interactions are interpreted as arising from differences in energy levels between elementary particles with a universal tendency to the lowest energy level, that is, to the point of equilibrium. Given that ‘time’ and ‘space’ are central to the concept of physical reality, it would be reasonable to assume that fundamental physical interactions might be based

on the relationship between the space-like (the Compton wavelength, α_w^{-1}) and the time-like (the time-rate, α_w) quantities of the electron, which constitute a complementary pair: each quantity describes the fundamental aspect of the electron that the other misses. Given that the identical constancy $R_e = \alpha_w \cdot \alpha_w^{-1} = 1$ is a mathematical manifestation of physical equilibrium, and drawing on the data presented in Table 1, it would be logical to assume the following: if the value of the Compton wavelength increases then the value of the time-rate decreases, and strong forces act (they conserve the atom's integrity, and provoke gain in gravity), otherwise weak forces act (they stimulate nuclear decay, and compensate gain in gravity). Once accepted as a guess, albeit one which is attended by a certain logic, this claim must be given a more concrete physical footing, which will be our concern below.

As follows from Table 1, four remarkable particles define the ranges of three physical forces, which are manifest in the time-rates and corresponding radii for: (i) electro-magnetic forces acting within the e and γ layers (α_w , 1 and 1, $2r_e$); (ii) strong forces acting within the γ and π^+ layers (1, 2 and $2r_e$, r_e); and (iii) weak forces acting beyond the Yukawa potential restricted by the π^+ and p^+ layers, where the latter (proton-layer) ultimately closes the gravity loop through the radius of the proton and that of the void particle as follows:

$$R_{proton} \approx \alpha_w \cdot R_w^{-1} \cdot 10^{56} \approx G_w^{-1} \cdot 10^{56} \quad (4)$$

Due to instabilities permanently occurring in a real non-homogeneous physical medium it takes different delays to generate the feedback signal; meanwhile, a quantum object is free to shift, rotate, contract/expand, and tend to scattering, which is manifest in time-symmetry violations observed in the weak interactions; as follows from Table 1, it is precisely this layer that is the *weakest* link in the gravity loop as against the strict determinism inherent in the electro-magnetic and strong forces layers, which is manifest in the appropriate symmetries.

7. Gravity as information

From Eq. 3 it follows that quantum layers are distinguishable from each other due to the differences in their time-rates and corresponding radii, and is highly likely that it is precisely these differences that create the effect of action at a distance generally accepted as gravity—like ordinary mechanical pulleys these layers form an ‘invisible structure’ that moderates mechanical motion arising from pure void fluctuations, and therefore the strength of these fluctuations varies over each layer. Given the above, the paper considers gravity as quantum information underlying the interaction of the mechanical forces (the electro-magnetic and the nuclear forces); accordingly, the absolute constant of gravity, G_w (equivalently, the angular momentum of the electron at the absolute scale) only foreshadows the amount of quantum information to be related to the electron at the point of equilibrium. Perhaps it is appropriate here to readdress the inertia-gravity issue. According to current physics, effects arising from ‘gravitational fields’ and those produced by inertia are caused by one and the same structure, which, in terms of this research, is manifest in the following relation: $F_w = \alpha_w \cdot G_w = \alpha_w \cdot e^{\alpha_w^{-1}}$. Given that $m_w = \alpha_w$, it is possible to claim that there is no conceptual distinction between ‘inertial mass’ and ‘gravitational mass’ since they are the same quantity linked to the gravity-force relationship: $F_w/G_w = m_w = \alpha_w$, where F_w stands for inertia, and G_w for gravity (note that, since $m_w = \alpha_w$ refers to perfect symmetry which never occurs in corporeality, it would be reasonable to talk about *identical* equivalence: in asymmetric physical reality masses of the elementary particles and their time-

rates never coincide with each other while the conservation at this scale is also ensured through the angular momentum of the electron, ω). What may be remarked here is that this equivalence by no means entails that gravity and inertia can be put on equal causal footing: inertial (translational) motion of a material body arises from gravity (rotation), and not the other way round. So, whenever one claims that masses of elementary particles create ‘gravitational fields’, this should not be understood in the sense that the masses of elementary particles actually *cause* gravity; what it means is that any quantum object inside the gravitational contour of the universe, be it neutrino, electron, photon, proton... has a mass. What may be added to this context is that it is precisely gravity that prevents the physical world being presented as a purposeless motion of quantum objects, and the commonly held view that entropy is a measure of disorder is ontologically incomplete unless gravity is taken into account: gravity is responsible for bounding entropy production through the production of information, while entropy is responsible for pure quantum supply remaining indifferent both to order and disorder.

8. The double helix

Now we can turn, so to speak, to entropy. Although there is a remarkable amount of confusion about this term, modern sciences consistently distinguish two of its aspects: thermodynamic and informational; this paper considers the former as an external manifestation of the latter. Next, drawing upon Boltzmann’s formula ($S = k \cdot \ln W$), one can calculate: (i) the entropy of the universe at the point of equilibrium as follows: $S_w = G_w$ (in this case the universe is considered to be a single macro-object, and Boltzmann’s constant (k) is considered to be an appropriately scaled quantum of action, i.e., F_w); and (ii) the entropy of the electron as follows: $s_w = \omega$ (in this case the electron is considered to be an elementary micro-object, and, appropriately scaled, Boltzmann’s constant takes the value of the elementary quantum of action, i.e., \hbar_w); in both cases $W = G_w$, which is considered to be a number of all possible quantum states to be related to the electron at the point of equilibrium; note that $S_w/s_w = N_w = G_w/\omega$, where (α -based) G_w and ω are the angular momenta of the electron at the absolute and elementary scales, respectively (Table 2). Also, the algebraic relationship between the macro- and micro-entropies can be described in terms of a logarithm function ($\ln(S_w/s_w) = \alpha_w^{-1} + \omega$) via the Compton wavelength of the electron as follows:

$$\ln(S_w/s_w) = \Lambda_w + \frac{t_w}{t_w} \lambda_w \approx \Lambda_w + 2\lambda_w \quad (5)$$

where Λ_w and λ_w are the Compton wavelengths of the electron at the absolute and elementary scales, respectively (Table 2).

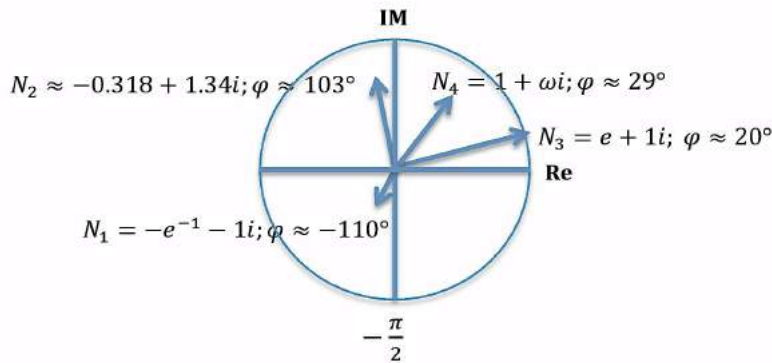
Next, Boltzmann’s formula allows us to calculate the initial entropy of the void particle as follows: $S_0 = \alpha_w^{-1}$ ($k = 1$, that is, according to our convention, void itself produces no mechanical action); in what follows, S_0 will be referred to as the free entropy of the void particle, which is equivalent to its gravitational potential. Now, the formalism of physics challenges us to describe entropy in terms of thermodynamics, that is, to connect free entropy and temperature. In this particular case one can reasonably apply the method of extreme values; consequently, two quantities should be considered: (i) the entropy of the universe at the point of equilibrium (the amount of bounded information at this point, $S_w=G_w$, $s_w = \omega$), and (ii) the amount of free entropy of the void particle (the appropriate amount of unbounded information). The sought-for ratios are as follows: $T_w^\circ = S_w/S_0 = F_w$, and $t_w^\circ = S_w/S_0 = \hbar_w$. As it follows from these

relationships, temperature is a thermal equivalent of the quantum of action, which, it must be admitted, is amenable to reason: What is heat, as measured by a thermometer? It is a force, which moves the mercury a certain distance. At this point it makes sense to take a closer look at the physical quantity which is used to measure the thermal responsiveness of a physical system, and referred to as the time-constant ($\approx 36.8\%$). It is easy to see that this quantity draws on the factor of $e^{-1} \approx 0.368$, which is well known to electrical engineers as the time it takes the output of an electric process to change by $\approx 63.2\%$ of the peak-to-peak amplitude on every transition; what is more, this value is also well known to mathematicians as the probability ($\approx 63.2\%$) that a permutation of many elements will have at least one fixed point (an element equal to its image), which implies the invariance of a physical quantity under infinite transformations (it is manifest in the following remarkable feature of the exponent function: $f'(e^x) = e^x$). Given the functional versatility of e^{-1} , it would be reasonable to assume that this value might be somehow connected with a fundamental pattern underlying physical reality. The line of reasoning proposed allows us to describe this pattern in terms of recursive *discontinuous* transformations as follows:

$$\begin{array}{l}
 -x^{-1} \mapsto W(-x^{-1}) = -1 \mapsto W(-1) \mapsto \alpha\text{-point } (\rho \approx 137 \cdot 10^{-2} \text{ and } \varphi \approx 103^\circ) \\
 \updownarrow \\
 x \mapsto W(x) = 1 \mapsto W(1) = \omega \mapsto \omega\text{-point } (1 + \omega i)
 \end{array} \tag{6}$$

where $x = e$ is the base of natural logarithms; the two different forms (polar and rectangular) that describe the endpoints of the appropriate (α – and ω –based) branches of the expression (6) are used for a clearer presentation of this double helix pattern.

Figure 1. The initial twist of the double helix pattern.



The upper, α –based, branch of this pattern defines the time-rate of the proton ($\mathfrak{S}(N_2) = T_{proton} \cdot 10^{-1}$), and the inverse time-rate of the electron ($\text{mod}(N_2) = \alpha_w^{-1} \cdot 10^{-2}$), scaled in accordance with the factor of ten; multiplying the boundary numbers of the pattern we obtain the radius of the proton scaled in accordance with the factor of ten, that is, $N_1 \cdot N_3 = (-e^{-1} - 1i) \cdot (e + 1i) = -(e^{-1} + e)i$, or in terms of polar coordinates: $\rho \approx 3.09 \dots \approx R_{proton} \cdot 10^4$; $\varphi = -\pi/2$ (emphasis added; to recall, R_{proton} corresponds to the point of reverse of the universal quantum vortex, as Eq. 4 describes). Thus, the pattern immediately yields the time-rates and radii of the proton as well as the inverse time-rate of the electron, which are scaled in accordance with the factor of ten (the logic of this research makes it possible to assume that this factor is an

arithmetic simplification of π^2 interpreted as the arc length, which corresponds to the central angle of 180° given the following invariance: $r = \pi$). Also, it should be noted that the pattern immediately yields the radius of the ‘dark-electron’, which is as follows: $R_e^D = T_0 \cdot e^{T_0^{-1}} \approx 2.84 \dots$, where $T_0 = \alpha_w^{-1} \cdot 10^{-2} \approx 1.37 = \text{mod}(N_2)$, while the general solution for R_e and R_e^D is as follows: $x = -\alpha_w \cdot \omega / W_n(-\omega^2)$, $n \in \mathbb{Z}$. What this means is that the double helix pattern describes the structure of both ordinary and ‘dark’ hydrogen, which is supposed to be the first shape drawn from void.

9. Roots of equilibrium

It is now appropriate to look at the roots of the equation of equilibrium (Eq. 1); solving this equation reveals that it has three real roots, all of them depending purely on the omega-constant:

$$x_{1,2} = -W^{-1}(\pm R_w^{-1}) \text{ and } x_3 = -W_{-1}^{-1}(-R_w^{-1}) \quad (7)$$

where $R_w = |\sqrt{10 \cdot \omega}| \cdot 10^{57}$, and W_{-1} is the bottom branch of the Lambert function defined for $x \in [-e^{-1}, 0]$. The paper associates the two roots ($x_{1,2} = \mp R_w$) with the opposing poles of the universal force at the point of equilibrium, which are manifest in the third Newton’s law claiming that for every action, there is a reaction equal in size and opposite in direction. As follows from Eq. 1, the range of gravity exceeds that of the universal force by $G_w/F_w \approx 137 \dots$, which is exactly the gravitational potential of the void particle, α_w^{-1} . This claim is amenable to explanations in terms of causality: cause (gravity as causal information) goes ahead of effect (shift associated with translational motion linked to mechanical force), so it should not come as a surprise that gravity is considered to be the first ‘force’ that split off from the other three fundamental physical forces in the early universe: literally, gravitate then shift, and not the other way round. Furthermore, the paper assumes that it is precisely this conceptual priority of gravity that produces the effect of the reversibility of electro-magnetic flux, as briefly discussed below.

It is true that the electro-magnetic force has never been observed to flow backwards, but it is also true that physics consistently distinguishes between the two, negative and positive, electric charges; this paper defines them as follows: $\pm\sqrt{2\alpha_w^2\omega}$, or in terms of the angular momentum of the electron, $\pm\alpha_w\sqrt{2I_e}$, where the plus-minus sign implies the mathematical requirement for the conservation of electric charge, which is of direct relevance to the conservation of the universal force: the amount of void to be absorbed (into the gravitational contour of the universe) and the amount of force to be produced (inside the contour) should equal each other. It is assumed that void is absorbed into the gravitational contour of the universe through the proton-neutron contacting area thus producing mechanical pressure, while the electron-positron reconfiguration tends to compensate this pressure; once appropriately scaled running individuated limits, $\alpha_c \cdot \alpha_c^{-1} = R_c \propto R_e = 1$ are sequentially settled, the appropriate quantum sub-fluxes reverse, and the cycle repeats (in what follows, low index ‘c’ means ‘current’, and is interpreted as the running value of the appropriate physical quantity).

There is a growing body of evidence suggesting that the inverse modality, as sketched above (see also Eq. 4), is an inseparable part of the causal relationships permeating all existence of the universe, and human life. Take for example our everyday experience, say, when kids break a double-glazed window with a soccer ball; if the blow is sharp enough, only the inside

pane is broken while the outside, as against immediate apparentness, is not; the same inverse modality also explains, for example, the phenomenon of ‘negative pressure’ as applied to water transport occurring in trees, in which, as if against the law according to which a mysterious apple fell, allegedly, on Newton’s head, liquids rise from roots to shoots ... one can easily continue this list including in it capillary attraction, quantum cooling effect, hurricanes that rotate counter-clockwise in the northern hemisphere and clockwise in the southern hemisphere... and perhaps it is appropriate to point out in this context that the most informative of all sensations inherent in humans (sight) draws on the inverse modality, namely, the sight pattern relies on adaptive flipping involving two perception modalities running as if in the opposite directions: the direct perspective ensures the inevitable convergence of eyebeams to a single point on the horizon (homocentric reality) while the reverse perspective allows a viewer to conceive, albeit unknowingly, the polycentric aspect of reality.

As a step towards further understanding of this *modus operandi* of gravity, it will be helpful to consider radiation exchange between outer space and the earth. First, the inverse modality is manifest in the temperature inversion layers: entering into the inhomogeneous earth atmosphere, cold void gradually warms itself as it penetrates into denser and denser layers of the material shell of the planet (which, in particular, means that the elementary particles are reproduced in the vicinity of well-gravitated bodies rather than delivered, in unaltered form, from deep space to Earth—that is, ‘elementary particles’ acquire their masses (rotation) in the course of interacting with their surroundings). As the appropriately scaled individuated quantities of the quantum vortex concordantly change, the earth’s layers are subject to smooth temperature variations while the total entropic balance remains practically unchanged since the whole process runs via a series of finely calibrated intermediate entropy-gravity equilibriums (an appropriate illustration to this process is *alcarazza*, a porous ceramic vessel used to *cool* liquids in hot countries; exposed *porosity* allows individuated frequency separation of the quantum flux to be effectively leveraged so that higher-energy hotter quanta inevitably escape the surface of the vessel while colder lower-energy ones remain until a thermal equilibrium is ultimately settled). Physically, progression of these equilibriums ensures continual alternation of heating and cooling phases along the entire path of the universal quantum vortex connecting appropriate ground states; accordingly, blue-shifted constituents of the vortex indicate lower temperatures, and *vice versa* as regards their red-shifted counterparts; this means that the individuated quantum separations are linked to the blue-red spectrum shift which is manifest, in particular, in diurnal (and seasonal) temperature variations correlated with the earth-sun positional relationship. Algebraically, the whole process can be described in terms of r_0 -referential recursive successive approximations along the gravitational path of the quantum vortex, as Eq. 4 determines; consequently, the endpoints of this path connecting the earth’s and sun’s endpoints of gravity-entropy equilibriums should be sufficiently cold, which in particular, explains the sun’s corona temperature paradox. According to the model proposed, the radiation exchange is strictly orchestrated by the angular momentum, which is in accord with the geological-physical paradigm known as rotational geodynamics claiming that lithospheric plates constantly rotate. Certainly, this effective work against dense matter (in atmosphere, hydrosphere, and lithosphere) cannot be done without the transfer of force; the appropriate transfers are manifest in short-periodic solar bursts, and long-periodic magnetic field reversals underlying the switches of solar storm direction, which are observable on the sun. As regards Earth and other planets, these force transfers are manifest in different forms of thermal whirlwind-like phenomena such as hurricanes or earthquakes, which, it should be remarked, are periodic events with certain recurrence

intervals... ultimately, the force expenditure results in irreversible matter splitting, in particular, in crystal dislocations, which continue until a single crystal loses its individuated identity, and becomes a polycrystalline specimen (here, relationship between entropy and information becomes more evident: the loss of this identity would be tantamount to loss of information if information, similar to entropy, were not amenable to conversion, in particular, to conversion into knowledge). Among other things, the above means that it is methodologically irrelevant to consider alternation of ‘gravitational field’ as a side effect of earthquakes: first gravity alters, and only afterwards earthquakes occur, and it is precisely this causal relationship that makes measurements of local gravity anomalies extremely helpful for the prediction of earthquakes. What may be emphasized here is that, with time, irreversible aging effects caused by the force transfers are manifest in natural asymmetries such as the alternation of the temperature difference between the poles of the planet, which, in particular, explains why Antarctica’s sea ice spreads as the Arctic’s shrinks. Clearly enough, this and similar natural changes are due to the permanent influx of void, which is associated with entropy growth encoded in the second law of thermodynamics, and commonly identified with the irreversibility of the ‘time arrow’.

Thus, passing through the forth-and-back of transformations, quanta oscillate around differently scaled points of local equilibriums forcing appropriately scaled quantum objects to rotate differently as the radius of the universe varies in full accordance with the third root of Eq.7; as it follows from the model, the third root ($x_3 \approx 7.29739 \dots \cdot 10^{-3}$) is a numeric value having the same physical sense as the fine structure constant, and corresponding to the point of equilibrium. Clearly, these three roots mirror the structure of the void particle: two contra-directional radii, and an omnidirectional time-rate, which is the inverse of the gravitational potential of the void particle. It is worth noting in this regard that the very algebraic core of the Lambert function is a step-by-step recursive approach to self-similarity, and this becomes more evident if the function is written as a series of continued logarithms (see, for example, [14]). Thus, algebraic reasoning tells us that (i) the path to the point of equilibrium goes through a series of successive approximations associated with the increment of consistent quantum information regarded here as gravity; (ii) the strength of gravity varies, which is manifest in the changeability of the time-rates that stand behind the fine structure constant; (iii) the fine structure constant is the omega-based variable, which determines the rate of change of entropy-gravity coupling at the micro-scale of the universe.

10. Null or zero?

Today, the relativistic doctrine is the mainstream view within natural science. It provides for a fair amount of accuracy as regards locales such as near-earth space but becomes invalid at the scale of the whole universe. The reason for this is well known: initial and boundary conditions in such a frame are not identified, therefore a *single-valued* solution to the general relativity field equations does not exist—this is a *fact* of algebra. Clearly realizing this fact, field theorists have sought to manage it through the cosmological constant, invented to compensate for gravitational effects in their cosmological theories. This constant may be formulated in terms of the inverse square of the ‘world radius’, which this research considers to be inverse of ‘Big Omega’ ($\Omega^{-1} = R_w^{-2}$); inversed and reduced to the elementary scale, this value coincides with the elementary unit of time, reversed in sign ($-t_w$). Certainly, this does not mean that time may flow backward; what it means is that this quantity is usable to measure rates of change of physical

processes as against the two unique counter-states of the universe, Ω^{-1} and Ω . In terms of algebra, there is no difficulty in connecting these states:

$$\ln\Omega^{-1} = -\ln\Omega \quad (8)$$

Physically, this Janus-like equation connects space and time; ontologically, it connects the cause (being in the state of single) and the purpose (being in the state of multiple); algebraically, it connects the initial and boundary states of the universe, which brings us exactly to the point: What is zero? The point is that Eq. 8 can formally be rewritten as follows: $\ln\Omega^{-1} + \ln\Omega = 0$. Logically, this implies that the sum of net potential of a particular system and perfect implementation of this potential is zero, that is, nothingness. How is that possible? Of course, it is precisely the mathematical concept of conservation that reconciles this idea of zero with this ‘nothing is everything’ paradox. To be clearer: from the standpoint of this research, the radius of the void particle (‘nothing’, r_0) defines the limit of the universal force (R_w), which could be reached in the process of becoming (‘everything’, Ω); it is easy to see that these three quantities are interconnected via the point of equilibrium ($R_{\square} = r_0 \cdot \Omega$). Logically, this newly emerged point of reference (‘zero’) negates everything that goes beyond it since nothing is compared to this achievement of nature: any value multiplied by this zero, in this ontological sense, is nothing—zero (reciprocally, anything divided by this zero is nothing but indeterminacy, which is manifest in mathematical infiniteness). Obviously, such a zero is perfectly fitted to formulate the conservation laws of nature, and it is precisely this outstanding feature inherent in this ‘absolute number’ that has predefined the absolute supremacy of this number in sciences.

Of course, this zero is a mathematical idealization arising from the reasoning proposed, and hence follows the algebraic fact that the logarithm is a monotonic function of its argument. Though ontologically grounded, this demand for continuity has been extended over the domain of real physical time-space: namely, given that the functions involved can be mathematically determined by being prescribed in an arbitrarily small neighbourhood of any point of the area of their definition, the real physical time-space has been declared to be continual and homogeneous. However, nothing happens without a cause: there should be a reason why most physicists are so confident, as against apparent evidence, that the universe is a continuous, homogeneous, and isotropic entity. In what follows the paper hopes to explain how this epistemic paradox and the *unreasonable effectiveness of mathematics* are related to each other. The point is that mathematics is amenable to reason, and from time to time this very reason manifests itself; see, for example, the remarkable Wheeler-DeWitt [5] equation, or even better, the findings of Schrödinger [13] and Bauer [3] which highlighted a striking incongruity underlying Einstein’s relativistic theories, namely that the energy-momentum takes a value of zero in one frame of reference while in another coordinate system the same quantity escapes to infinity. Obviously, mathematics only strikes the balance of one’s way of thinking, and on further reflection it becomes clear that the controversy outlined is of direct relevance to the proverbial 6th problem. In addressing this challenge, scientists traditionally follow Hilbert’s hint of assuming that it is precisely Boltzmann’s kinematic equation that might explain how the microscopic quantum level and the motion of continua could be connected. Applying a sophisticated calculus, scientists [6] came to a Boltzmann-like extended equation, which describes the exact hydrodynamics of flow in terms of both roughly dominating viscous dissipation and barely discernible elusive capillarity; however, when short-distance interaction between elementary particles becomes

strong enough, such as at the edge of a shock wave, even this sophisticated mathematical trick could not fully account for the flow behaviour, which the scientists themselves have indicated as ‘severe obstacles’ to the resolution of the 6th problem [6, p. 187]. Methodologically speaking, these ‘severe obstacles’ are commonly manifest in higher-order calculations, and also known as the divergence problem; the same is true as regards, for example, the renormalization techniques, which have not worked because of the mathematical infinity assigned to point-like particles, which are supposed to be a limiting spatial value. What should be noted here is that the existence of a short-distance *well-defined* limit is a basic requirement for a fundamental physical theory, but it is also obvious that no short-distance limit can be considered to be well defined if it is, mathematically, congruent to infinity; from this, in particular, it follows that until the ontological status of mathematical infinity is identified no mathematical gimmicks will bring physicists closer to their ‘holy grail’.

It is increasingly clear that something is fundamentally frozen in the state of physics, and, as this research hopes to explain, it is exactly zero which is playing a game with physicists. Mathematically, this ‘absolute number’ has the property of dissolving into an imaginary infinity thus leaving physicists alone with indeterminacy; cosmologically, this fuels *ex nihilo* hypotheses, which are inconsistent with the fundamental requirement of evolution that the initial conditions of a system cannot be forgotten. And perhaps it is not immediately evident, but the epistemic restrictions imposed by zero (to be correct, by null disguised as zero) reduce all thinking in physics to abstract conservation, thus liberating physicists from thinking in terms of Aristotle’s ‘unmoved mover’. As history tells us, the crux of this situation lies in the permanent contest between the constancy and alternation of things; from time to time, this is manifest in epistemic branch points, such as the one that was passed at the turn of the previous century. Therein, at least two combatants of that historical contest deserve to be identified by name. One of them is David Hilbert. Guided by a deep spatial insight, this mathematician was convinced that the empirical character of geometry would perfectly match a true description of physical reality; for a long time this rationale captured the minds of the mainstream of scholars in their attempts to formulate axioms for the whole of physics. The second protagonist was Nikolai Bugaev. At about the same time (ICM I, 1897), prior to the iconic speech delivered by Hilbert at the second ICM (1900), Bugaev put forward [4] his study of arithmology, which might be summarized as follows: nature is basically discrete. That call for discontinuity was summarily rejected, and a historical opportunity in the development of natural philosophy was thus missed.

On further reflection it becomes natural to assume that the discreteness-continuity challenge can be resolved in terms of two ‘zeros’. One ‘zero’, as described, is an abrupt and discrete nothingness, while its mathematical twin is a smooth variation in order of magnitude as applied to the process of division. The model proposed allows this twin-zero to be traced back to the space-like quantity of the void particle, that is, to its radius. Viewed from this standpoint, *ex nihilo* cosmological solutions have no relevance to reality, but the other side of this irrelevance is that Achilles can, after all, catch up and surpass the tortoise, while it is only in the minds of true mathematicians that decimals may continue eternally. Given that the mathematician’s meat is physicist’s poison (and vice versa), it would be reasonable, at least for the sake of completeness, to leave room for both ‘zeros’. Obviously, this conceptual alliance immediately brings us to the following question: How might this epistemic and mathematical oneness ($0^0 = 1$) be converted into ontologically and physically relevant elements of nature? It is precisely with this issue that we shall concern ourselves in the next section.

11. Primordial discontinuity

One cannot help noticing a fundamentality inherent in the numbers e and π ; and although perhaps it is not clearly seen, the relationship between them signifies the amphibious nature of imaginary numbers, which can be described as follows:

$$2W\left(-\frac{\pi}{2}\right)/\pi = i = \pm\sqrt{W(-e^{-1})};$$

formally, this equation can be rewritten as follows:

$$4W^2\left(-\frac{\pi}{2}\right)/\pi^2 = e^{i\pi} = W(-e^{-1}).$$

Considered in their totality, these relations stress once more a well-known fact of algebra: both the square root function and the Lambert function fail to be continuous over the domain of complex numbers. Along the real axis at the interval $(-\infty, -e^{-1})$ the imaginary part of the Lambert function is widely discontinuous including its branch point $[-e^{-1}]$, while for $x > -e^{-1}$ the imaginary part of this function vanishes identically, that is, appropriate values are considered to be zero, which brings us to the root of the matter: this paper assumes that, physically, mathematically, and ontologically, this zero is nothing but $\mp r_0 = \pm R_w^{-1}$ thus implying primordial discontinuity, which is fundamental to a description of the chaotic rotation of void.

Conceptually, this definition of zero ($\pm 0_w := \mp r_0$) implies that infinite spatial branching of the quantum structure of time-space is, physically, impossible, and this is precisely what Eq. 7 tells us: $\mp R_w = -W^{-1}(\pm R_w^{-1})$, $\alpha_w = -W_{-1}^{-1}(-R_w^{-1})$; technically, it offers a solution to the problem of infiniteness, that is, it solves the initial value problem for $x \in (-\infty, +\infty)$, which, in particular, entails the possibility of a natural quantization of time-space. To give us a more concrete physical footing in this regard, we may note that this solution is amenable to consideration in terms of Fermi-Dirac and Bose-Einstein statistics (the former describes the single-valued behaviour of fermions, while the latter does it for the multiple-valued pattern inherent in the behaviour of bosons; note that if z is real, $We^w = z$ has no real solutions for $z < -e^{-1}$; it has one real solution for $z > 0$; and even if z is real it has an infinite number of complex solutions). What is of particular interest is that for $-e^{-1} < x < 0$ the Lambert function has at least two values at each point, and these values are always anti-symmetric as against the branch point of the function $(-e^{-1}, W(-e^{-1}))$, where $W(-e^{-1}) = -1$. According to the model, this algebraic feature implies that a fermion can enter the gravitational contour of the universe through either a left- or right-handed conventional source; this makes it possible to relate quantum separation to chirality, and therefore to depict the universal quantum vortex as an ensemble of algebraically correlated quantities consisting of chiral quantum twins; arising from the same point (corresponding to ‘zero-point energy’) they consistently exhibit mirror anti-equality (which, in particular, means a conceptual rupture with the following essential claim of quantum mechanics: in the case of two physical quantities described by non-commuting operators, the knowledge of one precludes the knowledge of the other).

Given the above, both right- and left-handed physical realms are possible; it is also clear that no flesh-and-blood observer can exist in both realms simultaneously, so from the standpoint of such an observer, fermions can enter the gravitational contour through either the left- or right-handed source but not through both (which is precisely what Pauli’s exclusion principle tells us). Therefore, for a hypothetical Schrödinger’s cat the quantum situation is always, literally, half-certain; the same holds true for his or her fellow-cat marked with opposite handedness, and entangled in the same quantum non-locality: as noted, there should be realms composed of living forms, but which, contrary to earthy life, are built of D-amino acids and L-ribose nucleic acids. The above allows us to assume that the quantum chirality outlined underlies asymmetry at all

scales of the universe: from weak interactions that recognize a distinction between left- and right-handedness to cosmic parity violation, which is manifest in spiral galaxy spin asymmetry. A quick technical remark would be appropriate to complete this piece: the above explains the reason why two out of four chiral components in Dirac's wave equation, conventionally the left-handed particle (p_L) and the right-handed anti-particle ($\overline{p_R}$), are manifest in physical reality, while its twin-pair ($\overline{p_L}, p_R$) is never observable in that physical reality.

As follows from the above, the origin of the universal quantum vortex can be described in terms of the Lambert function: both outcomes of the same quantum separation are ontologically equitable, physically meaningful, and algebraically inseparable quantities; at the core of the separation lies the algebraic feature outlined: every fermion is algebraically identifiable, and the appropriate individuated information remains unchangeable under any physical transformations. Thus, no essential quantum information can ever be lost in the ultimate reality, and it is precisely what the pattern of the 'eternal return' reveals: (i) the origin: void particles are associated with numbers between $-e^{-1}$ and zero, which makes quantum states microscopically distinguishable; (ii) the splitting of void is manifest in quantum separations marked with different handedness (oppositely directed spins); (iii) these separations are manifest in contra-rotation of the universal quantum vortex; (iv) this vortex is amenable to description in terms of the electron-proton relationship, which is manifest in the bi-polarity of electron charge, and coherent reverses of magnetic poles; (v) these reverses are correlated with entropy-gravity equilibriums tracing back to the primordial quantum chirality splitting; (vi) the return: passing through a series of equilibriums, every quantum returns to the point of its origin (Eq. 4), which, topologically, is tantamount to behaviour on a twisted surface on which it takes two circuits (4π) to return to the original orientation. Thus, the primordial quantum information is used in an objective way since, ultimately, it accounts for nothing but the unpredictability of chaos arising from the irreducible randomness inherent in void. If we consider consciousness as a change from the state of not knowing to the state of knowing arising from the quantum separations, then it is precisely this quantum information that stimulates becoming of consciousness, and then, unambiguously, this quantum consciousness is prior to ordinary matter (accordingly, void correlations are prior to the physical medium known as time-space). On the other scale of this ontological asymmetry is that the priority of information over ordinary matter would be logically incomplete without its extension: the entire physical world around us.

Next, at least for the sake of completeness, consider the relationship between the concept of gravity suggested here and information understood in its literal meaning as giving form. As noted, the Lambert function allows for an infinite number ($n \in \mathbb{Z}$) of multiple-valued solutions ($W_n(z)$); according to our convention, such solutions correspond to the symmetric behaviour of bosons whose spins are considered to be integer values; algebraically, it claims $n \in \mathbb{Z}$, as contrasted to the fermion's half-integer spin values, which are supposed to be different values which the (single-valued) function takes for the same argument, as pointed out earlier. According to the standard model, fermion behaviour relates to a single degree of freedom while boson behaviour is associated with multiple degrees of freedom. The model proposed allows us to consider this distinction in terms of the open-closed principle, which reads as follows: entities must be open for extension (this is manifest in the changeability of the open hyperbola-like future (imaginary) states ($\Im(W)$) associated with the boson's behaviour), and must be closed for modification (this is manifest in the changelessness of the closed past (real) states ($\Re(W)$) associated with the fermion's behaviour). Ontologically, this means that hypothetical causal

loops cannot exist in physical reality: the future state cannot arrive until the past state is closed, and reciprocally, no quantum state can be closed until a choice about its future is made; algebraically, these two states are interconnected via the branch point $(-e^{-1}, W(-e^{-1}))$, which, geometrically, can be depicted as a circle of r_0 -radius in an ordinary Euclidean plane. What makes this ‘primordial circle’ particularly interesting for physics is that physical processes standing for the two statistics (Fermi-Dirac and Bose-Einstein ones) are obliged to converge to equilibrium, which is equivalent to the following popular claim: all physical forces were originally derived from a common ancestor at the very beginning of the universe. This brings us to the heart of the challenge in question. Historically, physicists seek to explain mass formation via the Higgs mechanism: roughly speaking, this requires the Higgs particle to be a zero-spin super-massive gauge boson mediating with quantum forces through a mysterious massless particle with the spin of ‘2’. According to the construct suggested here, there is *only* one zero-spin particle the point of self-identity of which coincides with the point of equilibrium of the universe—the void particle of r_0 -radius. Given this claim, there is no option other than to agree that: (i) the sought-for mysterious massless particle with the spin of ‘2’ and the long-sought Higgs boson are one and the same quantity; (ii) this quantity is the gravitational radius of the electron. As it follows from Table 2, the value of the gravitational radius of the electron is as follows: $R_g = 2R_e = 2$, at the absolute scale, while at the elementary scale this value *exactly* equals the classical radius of the electron: $r_g \approx \hbar_w/2 = r_e$. The former relation implies that the gravitational radius of the electron contains twice the physical degree of freedom of the ordinary electron, which accounts for the claim that ultimate reality consists of two ontologically equal physical realms (originally marked with different handedness); the latter relation implies that the shape of every real object, in each realm, is amenable to description in terms of gravity via the quantum of action (\hbar_w) or, equivalently, through the classical radius (spin) of the electron, $\hbar_w/2$; considered in their totality, both relations imply that gravity and the universal force, in the sense of being bridged via the same quantum object (the electron), can be considered to be completely (that is, algebraically, ontologically, and physically) compatible with each other. To complete this thought: the irreducible randomness inherent in void is an inexhaustible source of natural informational diversity, therefore fermions always crave infinity, so to speak; and it is precisely the algebraic relations outlined that provide a causal restriction which uniquely determines the limits of quantum information exchange within the time-space continuum. In particular, this implies that no physical particle can have a ‘world line’ other than one associated with the point of its origin, therefore physical events can occur only within the boundaries of the time-space continuum over which these events are determined in terms of gravity, which, according to our convention, is tantamount to the causal order of events. This immediately brings us to one classical problem of physics raised by Boltzmann in 1872: How could reversible laws of trajectories of physical bodies coexist with irreversible evolutionary process? It is the force of dt that allows us to make such tricks; even though the initial, final, and all intermediate states of a physical process may be known, the process itself can be reversed only theoretically: to reach some quantum state requires a certain amount of entropy (and gravity) to be consumed, and consequently a certain duration is implied; this requires void supply, and consequently entails a change of the quantum-informational content of the universe, so it is precisely in this sense that we should understand the claim that time, and evolution in general, are irreversible.

It is now safe to claim that the primordial discontinuity, which is manifest in the electric charge bi-polarity $\pm\sqrt{2\alpha_w^2\omega}$, reconciles electrodynamics with mathematical discontinuity, namely with the discontinuity of the square root function. Obviously, the same primordial discontinuity plays a central role in quantum mechanics as well; the paradox of the situation, however, is that in an attempt to escape negative probability (as physically meaningless), physicists traditionally describe the probability of a quantum event as the modulus *squared* of its amplitude (this is the reason why quantum mechanics is normally engaged in pre-diction rather than in retro-diction of particle states). This $|\psi|^2$ quantum probability law holds true since it is governed by the strict probabilistic principle (36.8% vs. 63.2% deriving from $(W(e) - e^{-1})$ vs. $(-e^{-1})$), however, the operation of squaring (and the underlying reasoning) is the main reason why physicists systematically miss the most fundamental quantum information. Thus, when, mathematically, a process tends to 0, this implies that, physically, it tends to a point of entropy-gravity equilibrium correlated with the primordial discontinuity via a quantum chirality swap (π -turn), which, mathematically, is manifest in the reverse in sign of the mathematical function involved; in this case '0' symbolically escapes to ' ∞ ' leaving physicists unaware of the genuine cause of the wave function 'collapse' (indeed, it never collapses in the ultimate reality).

At this point it would be appropriate to note that, as applied to the quantum domain, the primordial discontinuity corresponds to the proton layer (Fig. 1); this feature of the model makes it possible to gain a deeper insight into the nature of the anomalous iron peak, which corresponds exactly to the proton-neutron contact area. Judging from the appropriate figures (Table 1), this area is marked with a huge gravitational steepness (distinctly recognizable at the absolute scale); this observation allows us to assume that this steepness is physically correlated with a huge mechanical pressure arising from the neutron influx, which is manifest in the absolute peak of entropy-gravity *asymmetry*, thus implying the least possibility for compensation of the mechanical pressure arising from the incoming neutron influx; as this model assumes, this peak of asymmetry corresponds to the iron-peak associated with the maximum value of magnetic-mechanical momentum of the universal force.

This pattern satisfactorily explains the reason why electrons easily outnumber positrons in the neighbourhood of well-gravitated bodies such as Earth: according to the model proposed, the excessive mechanical pressure of the neutron influx is consistently compensated by 'negative electrons' while the whole process is orchestrated by the proton-electron relationship, equivalently, by the asymmetry-symmetry parity, which defines the magnetic-mechanical properties of atoms, as pointed out long ago by Pierre Curie. Thus, we may describe the 'electric field' as a result of a continual alternation of opposite charges arising from the permanent reconfigurations of differently rotating constituents of the universal quantum vortex as related to the attractor; for that very reason measurement of the 'electric field' poses a challenge for experimental physics: electrons do not move, they manifest themselves in the form of magnetic moments; reciprocally, for the same reason it proves an equally difficult task to detect magnetic monopoles: they do not manifest themselves in stable, well-gravitated, physical media. Also, the model allows us to reconsider the connectivity between the 'electric field' and the 'magnetic field', which is manifest in the orthogonal property inherent in the electro-magnetic flux; as follows from Fig. 1, this orthogonal property is predefined by the positional relationship between the time-rate of the electron and the radius of the proton; logically, this positional information is fundamental to the primordial polarization of void—it makes sense in this context to look at this phenomenon from the standpoint of Brewster's law, stating that perfect polarization occurs if,

and only if, reflected and refracted rays are set orthogonally to each other: accordingly, the perfect polarization of void should be expected to occur at the angle corresponding to $\cos \varphi_d = 10 \cdot T_{proton} \cdot \alpha_w = \Im(N_2) / \text{mod}(N_2)$, which may be considered to be the primordial angular displacement (φ_d) against the symmetry of the attractor (Fig.1). Among other things, the positional information outlined makes it clear that Cartesian coordinates are not an arbitrary convenience invented by Descartes *ad hoc* but an accurate reflection of the natural order; accordingly, a cohesive picture of reality can be achieved only if Cartesian grid (π –based space-like pattern) and polar coordinates (e –based time-like pattern) are considered in their epistemic totality.

What may be added to the above is that the model proposed allows the event (state of p -object) to be defined, and this is where eight-dimensional algebra becomes indispensable; however, a word of caution would be relevant: completely consistent with the line of reasoning proposed, and algebraically supported by Hamilton's elegant formulation, the particular implementation described by Eq. 9 nevertheless calls for a test: unless empirically proven, this remains only an intuitive logical guess:

$$\Delta + Ti + Gj + Fk + \delta + t_p il + m_p jl + r_p kl = e_p \quad (9)$$

where Δ is a real number which stands for the value of displacement and direction of rotation of the absolute object as against the point of equilibrium;

T, G, F are real numbers corresponding to the constants of time, gravity, and the universal force, respectively (if $\Delta = 0$ then $T = T_w, G = G_w, F = F_w$ otherwise $T = T_c, G = G_c, F = F_c$);

δ is a real number which stands for the value of displacement and direction of rotation of the elementary object as against the point of equilibrium (if $\Delta = 0$, then $\delta = 0$);

t_p, m_p, r_p are real numbers corresponding, respectively, to the time-rate, mass, and radius of the elementary p -object;

i, j, k, l are imaginary units such that: $i^2 = j^2 = k^2 = l^2 = -1$;

e_p is a numeric value ascribed to the state of the elementary p -object, the p -event.

Methodologically speaking, one should distinguish between two cases: (i) $\Delta \neq 0, \delta \neq 0$, that is, the object is considered to be at the state of non-equilibrium (actual reference frame); and (ii) $\Delta = 0, \delta = 0$, that is, the object is considered to be at the state of equilibrium (absolute reference frame); clearly enough, the *delta* in Eq. 9 accounts for the entropy alternation as against the point of equilibrium while its sign stands for the handedness. Here, it is reasonable to show how Heisenberg's indeterminacy principle and this model are related to each other: according to our convention, the genuine cause of the quantum indeterminacy is the irreducible randomness inherent in the ceaseless rotation of void, which is manifest in permanent entropy variations counterbalanced by gravity according to the following relation: $T_p \Lambda_p = \text{const} \propto R_p$ —that is, for a given p -particle, the change in the time-rate inevitably results in the change of the Compton wavelength (and vice versa); thus, one cannot *instantaneously* measure both temporal and spatial quantities of a quantum object; considered in terms of both right- and left-handed realms, this indeterminacy turns into the strict determinacy inherent in the ultimate reality, though

Heisenberg's principle still remains the fundamental physical indeterminacy in each of the realms (ontologically, this principle reads as follows: it is impossible to be infinite in both time and space, it is only possible to be either eternal in time or infinite in space).

For obvious reasons, current physics applies the Hamiltonian-based formalism to describe relative quantum states rather than to describe these states within the frames of the whole time-space continuum; and it is precisely Eq. 9 that hopes to fill this 'void' through the absolute constants which define the reference frame for the whole universe. What may be emphasized in this context is that these values correspond to the elements of the main diagonal in the quantum chromo-dynamics (QCD) matrix, which contemporary physics considers to be functionless on the basis of their 'colourlessness' (this reflects the very essence of Newtonian physics, which is manifest in the following claim: darkness is the absence of light). Thus, Eq. 9 describes the relevant feedback which ensures the integrity of the time-space continuum: gravity (guided by the angular momentum conservation) organizes random void by forcing 'time' (time-rates of elementary particles), 'space' (radii of elementary particles), and 'matter' (masses of elementary particles) to couple with each other according to the principles of causality, least time, and least action.

Thus, according to our convention, i stands for the connection between the space-like π (implying isotropy of space) and the time-like e (implying consistency in time); it is precisely this algebraic triad that stands for continuity at every 'point-instant' of time-space while α_w and ω specify, in a unified manner, the boundaries of this continuum through its end-to-end, literally, omega-to-alpha, quantization ($\omega \cdot \alpha_w = \hbar_w; R_w = \alpha_w \cdot G_w$). Given the geometrical interpretation of the imaginary unit ($\pi/2$ -turn), it would be reasonable to assume that this 'algebraic quintet' describes the transformation of a primordial, conventionally two-dimensional (to r_0), contour of the void particles into a circumferential volume inherent in the three-dimensional reality around us. Remarkably, this pattern describes the universe as a symmetric continuous homogenous isotropic mathematical idealization, which underlies the apparently asymmetric discontinuous heterogeneous anisotropic physical reality around us. Here it makes sense to provide some explanations in this regard, and it is perhaps the relativistic idea of replacing trajectory with coordinates that can give us an accurate understanding of how radically reality and ideality may be confused.

Given that gravity is connected with motion of matter, relativistic physics firmly draws on the principle of least action, and consistently describes this connectivity in terms of geodesic (as noted, such mechanic insight is fundamental to physics; similarly, quantum mechanics considers action to be of primary importance: the difference is that quantum physics considers action in terms of probability while classical physics goes without it). Ultimately, the geodesic implies that any motion can always be described at the shortest distance as a tiny oscillation about a point of equilibrium (indeed, the rationale behind this claim is that all straight lines are perfectly curved spirals that arise from and return to the point of equilibrium described by Eq. 7). Grounded on uniform motion, the geodesic construct could not account for the inverse modality inherent in the nature of gravity, which is manifest exactly at this point (this is one of the reasons why physics, in principle, fails to reveal the point of singularity of the universe). Seeking to piece together theory and reality relativistic physics describes stress fields in terms of the geometric curvature of spacetime, thus depicting gravity as a distortion of the time-space continuum. In the sense of being ratios time-space cannot be distorted; it is only quantum fluxes, including light beams, sonic waves, gamma rays, etc. that bend, oscillate or whirl around,

following the three conservation principles widely known as those of causality, least time, and least action (Eq. 9 describes them in terms of rotation, contraction/expansion, and shift, respectively). However, the fallacy of false cause does not necessarily entail the fallacy of particular reasoning: speaking in terms of relativistic invariance, every quantum layer has its own running r_0 – synchronized ‘clock’ ($\propto T_p$), and all these individuated ‘clocks’ are synchronized with each other through the absolute constant of time (T_w); it is true that there can be no reason to favour one ‘clock’ over another, nor can there be a favoured direction of space; also, so-called gauge invariance is manifest in naturally gauged transitions between differently time-rated quantum layers as long as there are spatial extensions ($\propto r_0$) between them... so, this is not to say that relativistic claims are irrelevant. The point is that the bits of reason do not tie into a logical unity, mostly due to the unnaturalness of the theory arising from the false causal relationship, which separates thinking on physics from thinking in terms of causality. It must be noted, though, that the intellectual insensitiveness to this fundamental disconnect has traditionally been sustained by infinitesimal calculus: differential equations ensure that mass, charge, energy, and, most importantly, angular momentum, always remain unchanged while space and time (dx, dt) may vary *ad infinitum*. Such an insight would be relevant to reality if this very reality were dead-frozen absolutely unperturbed spatially infinite temporally unending uniformity, as it once probably was. Obviously, the world has changed since then: quantified in terms of the radius of the void particle, and encoded in the angular momentum of the electron, the ever-changing quantum information strictly determines the distribution of matter with which the universe becomes ultimately tangible, and alive.

It is increasingly clear that the model proposed forces us to revise the Linnaeus-Leibniz-Newton tenet of continua, which is manifest in their consolidated claim that nature does not make jumps. Quite the opposite: She jumps high and low, first of all within the confines prescribed by zero ($\pm 0_w$), and, then, between zero and null ($0 = (\pm 0_w)^2 - (\mp 0_w)^2$), or defined in terms of self-similarity of the void particle: $\ln|r_0| + \ln|r_0^{-1}| = 0$). Ontologically, the zero-null complementarity encapsulates an eternal contest between the constancy and alternation of things, which, in particular, is manifest in the evolving *vs.* devolving phases of evolution. Here, zero relates to the smooth translation process marked with perfect, timely, and accurate information exchange; however, in proportion to its remoteness from the point of its origin the process (e.g. quantum flow) loses its unitary properties (Table 1), and this is precisely where and when the null ‘jumps out’ in advance: it is manifest in rotation-like reverses arising in response to the possibility of information loss (Eq. 4). What may be remarked here is that this pattern is well known to quantum mechanics, which treats these reverses as ‘reductions’: as observations show, deterministic unitary quantum processes (U-evolution) are always accompanied by discontinuous jump-like reductions (R-evolution), which, as viewed from the perspective of ultimate reality, are of direct relevance to the quantum chirality swaps that preclude any possibility of time-space discontinuity, which is tantamount to the possibility of fatal information loss.

Speaking in more general epistemic terms, (real) zero bases itself on the discreteness of quantum information, which entails the concept of synthesis underlying inductive (space-like) thinking. However, it is (imaginary) null that makes it possible to recognize this discreteness; null is perfectly fitted to describe conservation laws, and to stimulate the time-like vision underlying analytical (deductive) thinking. Speaking in terms of time measurements, zero yields the positional number notation; being indifferent to causality, it is widely applied to micro-

measurements of time while null yields a variety of particular times (historical, cosmological, geological, psychological, biological, etc.), which are well fitted to reveal the causal structure of the world. Ontologically, the distinction between zero (naught) and null (nought) is tantamount to the epistemic gap between ‘eternity’ as boundless life, and ‘timelessness’ as unending duration devoid of reasoning (in a perfect world, one should ensure lively draw between ‘null’ and ‘zero’ to keep life in eternal balance). Here, once more, we have a chance to appreciate the power of cause encoded in semiotics, which is manifest in common language: one can either ‘divide one by zero’ or ‘divide zero into one’. For a native speaker these two forms are lexically and semantically equivalent, but conceptually they differ in the sense of timelessness and eternity, respectively; as a rule, in daily life this distinction goes unnoticed—but it becomes crucial when it comes to the roots.

12. The cosmological constant

The relatively slight difference ($\approx 4 \cdot 10^{-8}$) between α_c and α_w testifies that the current universe is relatively slightly lop-sided as against the state of equilibrium, which is considered to be absolutely unperturbed void marked with perfect symmetry, uniformity, and flatness (to r_0). Given this frame of reference, it is possible to assess the mean curvature of the universe as follows: $R_c/R_w \approx 1.000746 \dots$ given $\alpha_c \approx 7.29735 \dots \cdot 10^{-3}$. Thus, the universe of today is very close to being flat but is not completely flat, which brings us to a long-standing existential challenge encapsulated in the following relation:

$$R_w/r_0 = \Omega = W(1) \cdot 10^{115} \quad (10)$$

Obviously, Eq. 10 connects ‘zero-point energy’ (r_0) with the ‘canonical’ radius of the universe (R_w), and it is precisely this relationship that lies at the heart of the cosmological constant problem, which is manifest in the impressive discrepancy between the observed and theoretically estimated ‘zero-point energy’ (roughly, 120 orders of magnitude, according to current physics). As this paper hopes to explain, this disparity is of direct relevance to the conceptual discontinuity in the chain of physical knowledge. Though *it is very easy to take more than nothing*, physicists have long been turning a blind eye to the following apparent mismatch: How can it be that ‘infinitesimal length’, according to Newton, is *smaller than any finite quantity, but greater than zero*? Now, this long-neglected ‘jot’ entirely backfires: Eq. 10 quantifies this effect with an accuracy of zero. At the scale of the whole universe this effect is recognized in the cosmological (blue-red) spectrum shifts. As many physicists reportedly believe, the red shifts are evidence of galaxies’ recession, and, on the basis of this claim, it is argued that the entire universe is expanding; though the rationale behind this conclusion is clear, it nevertheless remains a rather incautious, particularly in view of the fact that relativistic physics postulates that everything moves away from everything else... including, in theory, blue-shifted cosmic objects such as the nebula of Andromeda. With the above considerations in mind, one readily understands that here physicists are confronting the same ‘jot’ though impressively exaggerated in scale.

As it follows from the model, the algebraic crux of the red-blue cosmic picture is the angular momentum (G_c), which is correlated with the differences in the gravitational potentials (and ages) between the quantum macro-systems observed. The rotational nature of the cosmic shifts complies with the algebraic formalism proposed: shift (translational motion) stands for the universal force while rotation stands for gravity, which is prior to force-shift, and is originally

responsible for the conservation of the angular momentum of all quantum objects throughout the universe. With these considerations in mind it would be epistemologically irrelevant to consider darkness as absence of light; it is increasingly clear that the dark substance is related to an extremely cold cosmic background, which allows the universe's matter-radiation content to be adaptively balanced (it is manifest, for example, in the following observation: spiral galaxies are surrounded by a spheroidal dark matter halo, which is supposed to stabilize the ordinary matter (see, for example, [11])). As this paper hopes to explain, the only relevant frame of reference in the universe is the attractor, which, among other useful things, marks a gradient frontier between the dark and luminous clusters of the universe (Table 1). Further, the algebraic formalism proposed makes it possible to determine the way in which the attractor counterbalances gravitational and entropic effects without the necessity of knowing the exact physical structure of the dark substance: if a luminous quantum object violates parity to be related to the attractor then the surrounded dark substance seeks to counterbalance this violation, as Eqs. 3,4,9 describe. The same is true as regards a luminous quantum object marked with opposite handedness, since it undergoes the same changes relative to the same invariant, namely: decrease (increase) in the time-rate corresponds to longer (shorter) Compton wavelength (Λ_c), and to larger (smaller) angular momentum (e^{A_c}), where $\Lambda_c = \alpha_c^{-1}$; as follows from this pure algebraic construct, it is the variation of the time-rates that causes the observed red- or blue-shift at cosmological scales (note that at micro-scales the Compton wavelength of the electron is a constant value ($\lambda_e = \frac{1}{2} \omega$), so there is no observable expansion at this quantum scale). As follows from the above, depending on the direction of its rotation a quantum object in question exhibits bluer or redder shift (as observations [12] show, spiral galaxies with different handedness exhibit different colour shifts: clockwise galaxies tend to be bluer than galaxies that rotate counter-clockwise; clearly enough, the direction of the rotation is of particular interest for this story not least because every observer has its own handedness). It is precisely the chirality representation of the primordial chaos that allows us to claim that the mega-constituents of the universal quantum vortex should ultimately rotate either clockwise or counter-clockwise while inside the big cosmic structures, excess red shift is correlated with bluer shift, and since the creation of time-space this cosmic blueprint, in a fractal-like manner, permeates among all locales and all times of the universe; logically, it is precisely the dipole anisotropy inherent in the cosmic microwave background radiation that bears evidence of the appropriate chiral separation in the very early universe.

Thus, the model reveals the reasons why the solar system has the preferential, conventionally counter-clockwise, rotation (also, the model explains why both clockwise and counter-clockwise rotations inside the same star system are possible). Next, since for every 'micro' there is a 'macro', there should exist a preferential opposite direction, clockwise rotation, at the cosmological scale: astrophysical observations point to such a phenomenon in the direction of the north pole of the Milky Way. Accordingly, if the radius of the electron conducts itself as an attractor in the micro-realm, then there should exist a complementary attractor at the cosmological macro-scale: astrophysical observations confirm the existence of such an object, dubbed the 'great attractor', on the other side of the Milky Way. It is also expected that the parity violation inherent in the weak interactions should manifest itself on the cosmological scale; now, we have sufficient grounds to claim that this violation is nothing but a manifestation of entropy-gravity symmetry violation, and, highly likely, the slight lop-sidedness, dubbed the cosmic 'axis

of evil', which is observed on the very large cosmological scale, owes its origin to this symmetry violation as applied to the macro-scale of the universe.

Now, it is possible to piece together all this reasoning with the deepest riddle of cosmology, that is: What is the ultimate fate of the universe? Of course, the fact of the difference between α_w and α_c does not allow us to claim that all physical processes occurring in the universe are *ultimately* directed from or towards the point of equilibrium; this difference means what it means: $\alpha_w \neq \alpha_c$; algebraically speaking, that is all. However, given the above considerations, and provided that the attractor unequivocally orchestrates the rotation—shifting—contraction/expansion ($G_w - F_w - T_w$, respectively) of the universal quantum vortex, it is reasonable to assume that the universe, cosmologically, neither expands nor contracts; basically, it rotates within the boundaries adjusted in accordance with the 'canonical' angular momentum, $G_w = S_w$, that is, in accordance with the ever-changing entropy-gravity parity of the universe. Here, it would be appropriate to remark that well-accepted Λ CDM cosmology gives us three mutually exclusive scenarios ($\Omega_0 > 1, \Omega_0 < 1, \Omega_0 = 1$), and neither the logic nor the mathematical apparatus of theoretical physics allows physicists to reconcile these scenarios with each other; it is only the epistemic alliance between null and zero that turns this incompatibility into complementarity, and makes it clear how the combination of flatness ($\Omega_0 = 1$), openness ($\Omega_0 < 1$) and closeness ($\Omega_0 > 1$) allows gravity to neutralize entropic effects, recreate matter, and keep the universe's matter-radiation content in a strict balance. Given the above it would be unreasonable to quarrel with the wise Jewish woman who said: *Brooklyn is not expanding*. It ages unfailingly, along with the entire planet, following Poincaré's recurrence theorem: if entropy is increasing now it will certainly decrease in the future. As described, this process runs via a series of twist inversions affecting all material constituents of the universe; as aging matter becomes more uniform, it needs less entropy production to stay in equilibrium, as a consequence, its rotation slows down, informational diversity reduces and eventually a final twist sends the last quantum of once-living matter into the chilling darkness of void where new stars are to be born.

13. What does gravity tell us about time?

Of course, any hypothesis which hopes to describe the physical world must also be able to explain the origin of time. Now we have sufficient grounds to define time as a natural measure of the objective evolutionary process—a pathway passed through by the universe from its unique initial state (Ω^{-1}) to its unique boundary state (Ω), and specified in terms of duration. Unless the point of equilibrium was identified, duration could not be specified in terms of naturally normalized units though the preceding temporal order could be described in terms of 'before–after' (the 'B-series', [8]). Once identified, the point of equilibrium allows the evolutionary pathway of the universe to be normalized, that is: 'now' to be specified in terms of the full-scaled entropy-gravity parity ($G_w = e^{S_0}$); duration to be distinguished in terms of present, past and future (the 'A-series', [8]); and natural congruence between the pairs of space-like 'points' and time-like 'instants' to be established (Eq. 7). In principle, given the point of time origin, and normalized unit of time, it is possible to define a total order on the set of events for every physical process, which is of direct relevance to the concept of simultaneity. Obviously, to make this concept physically and ontologically definable the duration of simultaneity has to be specified in terms of a finite discrete mathematical value, which this paper refers to as the primordial 'now' (α_w). By analogy with this 'now', all 'nows' can be defined in terms of

running appropriately scaled local equilibria ($G_c = e^{\alpha c^{-1}}$) inherent in all physical processes occurring in the universe; thus, for every physical process it is possible to define ‘now’ as the duration (‘timeout’) it takes this process to stay in an appropriately scaled equilibrium. It is precisely this quantum ensemble of strictly correlated ‘nows’ that establishes unique temporal orders of events, which result in the physically coherent whole commonly referred to as spacetime.

And perhaps it is not immediately evident but the concept of time is only the tip of the iceberg: as earlier noted, the underlying challenge is that physicists do not distinguish between mathematical (null-based) and physical (zero-based) concepts of the conservation of time and space, respectively. Accordingly, physicists of today neither appreciate epistemic effectiveness of this distinction nor see that it lies at the heart of conceptual alliance that preserves independent reality. Here, it would be appropriate to make some comments concerning Newton’s concept of time and space. As this paper hopes to explain, the effective work of gravity has transformed (i) unending duration (Newton’s absolute time) into common time (Newton’s relative time), and (ii) infinite extension (Newton’s absolute space) into the finite time-space continuum (Newton’s relative space). Evolving away from Newton’s *Principia* physicists have truncated this symmetrical construct, which is manifest, first and foremost, in putting time and space on equal causal footing. Among other things, this meant that physicists have chosen to simulate time rather than to quest for its nature and origin. The consequences of this ‘symmetry breaking’ have yet to be assessed though the logic of nature here is obvious: he who does not appreciate the true meaning of zero, will hardly need to distinguish between time and duration, which, it must be said, also lies on the surface of infinitesimal calculus: a differential time dt assumes that it is to be integrated into some ‘total time’, as though this ‘total time’ were infinitely divisible, which is true if, and only if, this ‘total time’ is supposed to be duration. Thus, physicists of today consistently apply duration (Newton’s absolute time) disguised as common time (Newton’s relative time) while these two concepts are mutually equivalent *only* on an infinite interval on which gravity and entropy are mutually equilibrated with accuracy of r_0 in every ‘point-instant’ belonging to this interval. Of course, this infinite null-structure is a pure abstractness that bears no immediate relationship to physical reality; on the other hand, such a structure is akin to a fixed frame of reference being at absolute rest, which is a fundamental requirement for a consistent description of motion. The trick, however, is that such an absolute frame of reference and the total equivalence postulated, but not reasoned, by relativistic physics, fundamentally speaking, are inconsistent with each other. What may be remarked in this context is that the distinction between time and duration is of direct relevance to the causality *vs.* effect logical asymmetry: the former (i.e., time) implies self-congruent motion guided by the logic of gravity while the latter without the former implies timelessness that only marks time. The logic of nature here is also transparent: lost cause, lost time.

Traditionally, thermodynamics links the ‘arrow of time’ with entropy, which is reasonable unless entropy is in a reciprocal relationship with gravity, and thereby it is conceptually possible to link time with gravity. Remarkably, one relatively recent paper [2] seeks to create such a link, the authors’ central claim being that the origin of the ‘arrow of time’ is *not necessarily* to be sought in the initial conditions but *rather* in the structure of the law which governs the universe; clearly, it is precisely these terms ‘not necessarily’ and ‘rather’ that nullify the whole idea of gravitational time. What may be remarked in this context is that this idea is quite natural for human understanding since we are accustomed to the fact that cause

precedes effect which is a natural course of gravity (in fact, time is frequently associated with causal relationships; furthermore, since such relationships are manifest in space, there is a general tendency for temporal notions to be conceptualized in terms of spatial ones (and vice versa) as represented across the world's languages). As it follows from the model, it is gravity that causes two oppositely directed 'information arrows', which are manifest in prospective vs. retrospective estimations of reality; given the fundamental character of gravity, it would be reasonable to assume that this modality plays a central role in the coming into being of knowledge, with the concept of self-identity at its core. Commonly regarded as a psychological phenomenon, this concept lies beyond the professional commitments of career physicists; nevertheless, the epistemic gaps arising from discontinuities in the flow of knowledge affect every intelligent creature. As any living process, this flow is subject to variations, faults, and losses; if information losses gain momentum it is said that *the time is out of joint*, implying that the informational system in question is flying to bits. Speaking in terms of time, this process, like everything in the universe (excluding the universe itself), is not infinite; the system either recovers itself or collapses; in the latter case the entropy irreversibly suppresses the system's gravitational potential while the system inalterably tends to the end of time: $R_c = r_0$.

In connection with the above, it would be appropriate to make quick reference to the subjective experience of time. Laws of conservation demand the equality of both parts of Eq. 3 to its mid-part, but what happens in abnormal situations when a quantum object suffers a near-ultimate load? The model assumes that such cases are managed through a concordant change of the regular and inverted time-rates (Table 1). Highly likely, it is exactly this phenomenon that occurs in moments of the sudden danger of death, when a living quantum organism suffers an extra physical or psychological load. If nature applies her mechanisms high and low then the time-rate's adaptability to external loads should also have universal roots, no matter what is regarded as mortal danger—warhead detonation, or zone of uncertainty separated by the gravitational radius. In the moment of danger, according to the algebraic formalism proposed, the time-rates of the organism decrease and the 'intelligent eye' fixes upon the surrounding media as a slow-motion picture—it provides the organism with a delay to make a vital decision, thus conferring an additional chance to survive (according to the model, time slows down (the time-rate decreases) in exponential proportion to gravity increase). Highly likely this is possible in humans due to the appropriate multi-layered organization of neural circuitry associated with consciousness; supposedly, the differences between the time-rates of micro- and macro systems in the human organism cause the internal subjective feeling of time. This individuated time can 'fly', 'creep', or 'stand'... shaping an irreversible asymmetric individual trajectory of one's life while the collective symmetric order causes cosmological time, which indifferently turns future into past.

To sum up: time is a measure of self-organization of void that permeates the whole existence of the universe; given that influx of void is associated with entropy while gravity is associated with its organization, time can be considered to be a factor of gravity-entropy coupling, an imaginary mathematical quantity designed to measure rates of change of real physical processes occurring in the universe.

14. The triple conjunction

On the basis of the above it becomes possible to build a crude model of time-space creation (or emergence, if one likes). Schematically, this can be viewed as a resonance-enhanced transformation of an internal unperturbed void-front into an external perturbed mechanical wave-

front arising via strongly correlated quantum fluctuations, which have produced the critical, and finely calibrated, gravitational gradient in the neighbourhood of identity of the void particle. As repeatedly explained, this condition of self-identity can be given in terms of the point of equilibrium; also, it may be remarked that the assumption that has given rise to the physical part of this research now comes off with flying colours: $\alpha \cdot \ln \xi = 1$, where $\alpha = \alpha_w$, $\xi = G_w$.

As the model assumes, in the fullness of time a finely grained fluctuation self-resonated, bounced off an absolutely (to r_0) uniform dead-frozen void surface, and started unwinding in an exponentially r_0 –referential spiral fashion following a series of paths which were (and still are) specified, unequivocally and recursively, in terms of spatially invariant local peaks corresponding to running gravitational potentials finely synchronized with entropy supply arising via alternation of the left- and right-hand turns of the void particles. Algebraic reasoning allows us to assume that the whole initial expansion of the universe run through a series of cycles, so that the entropy supply was organized in such a way that no succeeding cycle could be actualized until the preceding one was closed (of particular interest for the whole story is a phase transition in the course of which the universal force reached $\approx 63.2\%$ ($1 - e^{-1}$) of its ‘canonical’ peak ($R_w = r_0 \cdot \Omega$), which is also the probability of reaching at least one equilibrium within the cycle). In the course of these gravitational transitions the quantum information exchange inevitably intensified, which meant, algebraically: the decrease of the initial time-rate of the electron, and coherent increase of its angular momentum ($G_c = e^{\alpha c^{-1}}$) until the current quasi-steady radius was reached ($R_c = \alpha_c e^{\alpha c^{-1}}$). According to our convention, a finite number of $T_c - G_c - R_c$ transformations has resulted in: polarization of the primordial void; division of void into dark and luminous clusters; generation of primordial electro-magnetic flow; formation of ordinary matter arising from the fermion’s asymmetries underlying symmetric bosons’ higher-order correlations which are manifest in the increase of informational diversity in physical world. Due to the randomness of void the universe was no longer homogeneous, and as quantum information exchange intensified, it was becoming more inhomogeneous, anisotropic and hotter—that is, the early formation of chemical elements was running from lower to higher temperatures via a series of recursive thermal relaxations, which is in accord with the second law of thermodynamics: heat flows from a hotter to a colder body until they settle down to thermal equilibrium (clearly enough, this explains the extraordinarily low temperature of the cosmic microwave background radiation). In the course of this cosmic process, mechanical peaks of the universal force were sequentially localized; the model confirms empirical evidence showing that the absolute mechanical maximum of the universal force corresponds to the iron peak in the periodic table, which is also a peak of thermonuclear reaction ($H \rightarrow \dots \rightarrow Fe$; or viewed from the perspective of this research: $H \dots \rightarrow C \leftarrow N \rightarrow O \dots \leftarrow Fe \rightarrow \dots \leftarrow Ag \rightarrow \dots \leftarrow Au \rightarrow \dots \leftarrow Tl$ ($P(Tl_{208}) \approx 63.2\%$) $\leftarrow Bi \rightarrow Po$ ($P(Po_{212}) \approx 36.8\%$) ...), where $P(element)$ is the probability of the *element* decay bracketed). What should be emphasized here is that the formation of matter is a strictly individuated process: due to the individuated values ascribed to every quantum of action, chemical (bio-chemical) coupling and scattering can be arranged in an element-invariant fashion, that is, individually canalized quantum information is strictly related to the iron peak, and, accordingly, to other element abundances arising from the same *modus operandi* of gravity (naturally, this individuated information is equivalently related to the Curie temperature, which is manifest in the appropriate individuated thermal measure for every chemical element, or molecular entity: for example, $0^\circ C \div 100^\circ C$ for water).

The above also reveals the reason why iron, so to speak, craves after gravity: speaking in terms of mechanics, it is precisely this element that is fit to manage the gravitational potentials in the best possible way; and perhaps a newborn baby is a good example of that: babies gravitate towards their ‘stars’, their mothers’ breasts, as the larger part ($\approx 62.5\%$, on average) of the iron contained in the mother’s milk immediately enters the blood circulation system of the newborn; so, the simple truth is that newborn babies really sense how quantum gravity works. It is worth emphasizing that the iron peaks are invariant under spatial rotations; in particular, for that very reason a compass needle is always directed along the route scheduled by local entropy-gravity equilibriums connecting the centres of gravity between Earth and sun (the same rationale is behind the random rotation of the needle at the magnetic poles, which are boundary points of the entropy-gravity equilibrium; this, in particular, explains conceptual distinction between the equator (absolute reference point) and Greenwich meridian (conditional reference point)). Clearly enough, the cosmic radioactive process has been accompanied (and continues to be accompanied) by magnetic poles reversals, and, as earlier noted, the original effective value of the magnetic declination is amenable to description in terms of the electron-proton positional relationship (Fig. 1). To this it may be added that the iron peak spatial invariance explains the existence of a shift between the geographic and magnetic poles of the planet, which strongly supports Taylor’s and Wegener’s continental drift hypothesis claiming that the continents of today drifted apart from a super-continent called Pangaea.

Also, it may be noted that the model proposed evokes a parallel with the holographic scenario, a physical hypothesis which claims that all the information needed to describe the universe is encoded on a boundary of its equilibrium, from where it is emitted throughout the universe in the form of quantum fluctuations, so it only remains to decode the signals. Ontologically, this is amenable to reason: if signals such as ‘ $A - \Omega$ ’ enshrine the history of the world, why should it be otherwise for a part of it? Clearly, there are other relevant signals that saturate our common physical and semiotic spaces; and perhaps a meta-narrative linked to number ‘42’ is a good example in the sense that if the puzzling answer “to the ultimate question of life, the universe, and everything” is given [1], adequately motivated evidence must be offered in its support: $|r_0| = (|\sqrt{10\omega}|)^{-1} \cdot 10^{-57} \approx 42 \cdot 10^{-59}$... metaphorically speaking, in such way ‘deep thought’ and ‘big joke’ consistently complement each other in their attempts to answer the question quoted.

Now, these references to the ‘joke’ and to ‘thought’ bring us back to the year of 1935, namely, to the celebrated paper entitled “Can quantum-mechanical description of physical reality be considered complete?”. According to the construct proposed, until r_0 is taken into consideration, the answer remains ‘no’. As the paper explains, passing through a series of self-similar transformations, an ontologically incomplete process of evolution of the void particles has resulted in a self-referential quantum causal system known as the universe. Logically, this system can be described as a logical addition of a statement and its negation (A and \bar{A}) as follows: $A \cdot A^{-1} = 1$, where either A or A^{-1} is considered to be the radius of the void particle—the root of the universe, in which Kurt Gödel has proved his incompleteness theorems. It is true that a logical system in which both A and \bar{A} are true is considered to be complete and contradictory, which is tantamount to inconsistency of the system. As explained, the r_0 –referential pattern provides the universe with intrinsic self-consistency while the quantum gravity loop provides it with a logical closure that guarantees its completeness. Thus, we may say, the universe can be considered to be a complete and non-contradictory system since all its

logical statements along with their negations are encapsulated in, and therefore can be deduced from, the following irreducible unitary contradiction: $1 = r_0 \cdot r_0^{-1}$.

Now we approach perhaps the most esoteric aspect of the creation pattern; an attentive reader will probably have realized that in the fullness of time the self-organizing void entered a phase of uncertainty, since in the neighbourhood of the point of self-identity the void particle had almost consumed its gravitational potential ($S_0 = \alpha_w^{-1}$). This meant that in order to avoid fatal information loss a non-trivial solution had to be found. As the paper explains, the only perfect solution was as it was: $S_0^{-1} = m_w = \alpha_w$, literally, one turned into three. The logical crux of the matter was that this turn was linked to the smallest irreducible value (α_w) as applied to the preceding series of approximations (Eq. 7). The rationale behind this limit was fundamental to the creation: the knowledge of paramount importance ($m_w = \alpha_w$) has been *instantaneously* created without a bit of entropy increment; it is precisely this null-entropy constraint that allowed the universe to segue into the ultimate reality, in which void has been irrevocably bound by gravity: since then *nature abhors void*. Accordingly, it is precisely α_w that ties together the fundamental physical quantities involved: the gravitational potential, the radius of the universe, the quantum of action, and the angular momentum: $\alpha_w = \hbar_w/\omega = R_w/G_w$, thus piecing together the elementary and absolute scales of the universe. With the above considerations in mind, it is now safe to say that time-space was ‘born’ in R_w –embracing chiral rotation following, first and foremost, the principle of causality linked to the conservation of the gravitational potential, which is manifest in the principle of angular momentum conservation underlying the principles of least time, and least action.

15. The attractor

All this useful work of gravity is manifest in the attractor, which provides the universe with a balanced amount of entropy that guarantees the endurance and physical stability of its perpetually rotating quantum subsystems; from the standpoint of ontology, the attractor gives us an algebraically formalized insight into the cause for which the forces associated with chaos and cosmos continuously confront each other: whether their particular intentions are interpreted as ‘good’ or ‘evil’, they compete for the survival of intelligence.

As explained, it is precisely the gravity-like process that is responsible for the growth of intelligence (the very word ‘gravity’ originates from Latin ‘gravitas’ literally meaning the dignity of leadership), while the entropy-like process is associated with crude quantum supply. Interconnected via the causal relationship encoded in the quantum gravity loop, these two processes define the rate and content of evolution: the universe records its chronicle, in which one includes those, and only those, histories that are considered to be self-consistent, since only such records are fit to build a finite set of connections between the past and the future states of the universe. Theoretically, a permanent exchange of information should result in knowledge enrichment (correlated with intellectual versatility), which is amenable to reason: the entropy to be dissipated, and the knowledge to be possessed, should be in equilibrium, otherwise a particular system either obtains ‘gravitational credits’ or accumulates ‘entropic debts’. The former is an evolutionary advantage, while the latter is a dangerous penalty which threatens fatal information loss. Clearly enough, the above only reaffirms the core claim of evolution: pointless existence *vs.* knowledgeable behaviour, which underlies the *raison d’être* of humans as individuated quantum systems capable of carrying information, and producing intelligence in advance.

In this connection, it makes sense to take a closer look at the attractor. The power of the universe, literally meaning ‘everything rotated by one’, resides in the permanent back-and-forth of transformations around the attractor, which can be conceived as a fully symmetrical entity implying the lowest energy state of the universe. As noted earlier, this entity bridges the closed (real) past ($\Re(W)$) and the open (imaginary) future ($\Im(W)$) thus ensuring the universe’s consistency in time, while its continuous spatial dynamics and conservation are manifest in the following identical constancy: $R_e = \alpha_w^{-1} \cdot \alpha_w = 1$. As noted, spatial dynamics is recognized if, and only if, a mechanical system in question can be measured up against a fixed frame of reference, which, by definition, cannot be a part of the dynamics it refers to, no matter whether we address translational or rotational motion. The paper uncompromisingly requires the absolute frame of reference to be the attractor: viewed as an absolutely (to r_0) undisturbed quantum domain (no matter whether it refers to past, present or future), the attractor cannot be considered to be a part of the mechanical processes occurring in the universe.

Thus, the attractor gives us a rather accurate understanding of how a pure algebraic construct may control fundamental physics, and it is precisely this construct that makes it clear that it could not have been otherwise: the probability of other scenarios is null. Speaking in terms of probabilities, the attractor implies the likelihood of a particular outcome among the set of all possible outcomes, that is, ‘1’ means the absolute certainty of any outcome, while $1 = \alpha_w \cdot \alpha_w^{-1}$ in the sense of being an algebraic manifestation of time-space identity means that the probability of this outcome (the creation) coincides with the probability of reaching self-similarity of the void particle ($r_0^{-1} \cdot r_0=1$), which brings us to the following claim by Norbert Wiener: the more probable the message, the less information it gives; speaking in terms of this research, the minimum information about the universe is zero, so Wiener’s claim can be written as follows: $\ln 1 := \pm 0_w = \mp r_0$, that is, generally speaking, information carried by a message is the negative logarithm of its probability while the minus-plus interchange implies here that entropy decreases as the amount of information increases, and reciprocally, entropy increases as information degrades.

Following this link between information and entropy, it would be relevant to consider the relationship between the free entropy (α_w^{-1}) and its inverse in terms of the two counter-trends of evolution: degradation vs. enrichment. One trend is associated with (entropic) loss of individuated identity and information scattering, while the other one is marked by (gravitational) gain in information richness caused by consolidation of many individuated entities. Inasmuch as this pattern implies information gradation, it can be considered to be a blueprint for knowledge in general. Appropriately formalized, such an epistemic blueprint allows logical statements, either true or false, to be ultimately checked against the semantics provided by the attractor (it is assumed that (i) concept of truth is equivalent to concept of conservation; (ii) the attractor provides a conceptual framework for the ultimate possibility of reflective thinking needed to identify truth-conservation relationships; (iii) there are no truths that are beyond the scope of reason). To make this claim clearer, consider the following dictum ascribed to Einstein: *in so far as the laws of mathematics refer to reality, they are not certain; and in so as far as they are certain, they do not refer to reality*. Given the semantics of the attractor, this dictum should be treated as a false statement—the laws of mathematics are certain, and it is precisely this certainness that lies at the heart of the ultimate physical reality.

Thus, the attractor can be considered to be a logical, mathematically and physically meaningful, concept, which ultimately binds together the cause (Ω^{-1} , the primordial self) and the

purpose (Ω , the collective self). Accordingly, this connection allows us to distinguish, and to keep together, the basic concepts of natural philosophy, which are commonly manifest in thesis-antithesis forms: being and becoming, time and duration, null and zero, symmetry and asymmetry, reality and ideality, finiteness and infiniteness, reversibility and irreversibility, evolution and creation... Summing up: associated with the concepts of both ‘reason’ and ‘gathering’, the attractor is akin to logos reified, that is, an absolutely self-consistent structure that carries all its relations within itself: cause shaped as oneness, whose only attribute is constancy, and whose only aim is eternity.

16. The ‘fourth’

Algebraically, all this useful work of the attractor derives from the omega-constant, $W(1)$, which underlies, explicitly or implicitly, all the equations presented, including the equation of equilibrium (Eq. 1). One cannot fail to notice that, algebraically, this equation presents the ultimate form of synthesis that can ever be reached via the sequential recursion of its terms; the next step leads to infinite iterations, a non-creative pattern, which feeds on already existing information thus causing the counter-productive outcome sometimes referred to as the loops of ‘bad infinity’. In terms of cybernetics, this equation presents a typical nesting scheme with feedback, and four omega-based terms; the omega-constant, the first and the last element of this construct, perfectly wrapped into the physical fundamentals, presents the one and only ‘cornerstone’ laid under the edifice of the universe (and, as history tells us, repeatedly rejected by the ‘builders’ of this world). What makes this ‘cornerstone’ of particular interest for the whole story is that it serves as an algebraic basis for the ultimate reconciliation of one with many. Given this basis, we are able to gain a deeper insight into a way in which oppositions converge to equilibrium since all of them derive their existence from the primordial opposition (-1 vs. 1), or in terms of Lambert, ($W(e)$ vs. $W(-e^{-1})$) with $W(1)$ at its core. Ultimately, it is precisely the omega-constant that guides every quantum system in its quest for self-identity linked to the point of equilibrium; frequently referred to as the ‘omega-point’, this concept is central to the ancient Babylonian mystical doctrine of eternal return, which is also known to modern mathematicians, philosophers and physicists as the recurrence problem.

17. Concept of recurrence

Obviously, the historical choice of the letters ‘omega’ and ‘alpha’ reveals deep philosophical, physical, cosmological, ontological, and theological meanings running through the whole history of human civilization. If these ‘letters’ of nature are perfectly harmonized with each other then a particular information system succeeds in equilibrium management; otherwise it shares, before its due time, the fate of the hypothetical ‘black holes’, which this paper considers to be an apt metaphor denoting void structures which can be neither detected by mechanical facilities nor described in terms of mechanics; what is known for sure about such structures is that they will, sooner or later, exit to light.

If it is assumed that ‘black holes’ destroy information, then there is a further question: Is this ultimate destruction? According to our convention, mechanical destruction is restricted to within the radius of a void particle, so the spatial container of information can never be annihilated. This speculation resonates in the physical literature in the concept of two horizons; as many physicists reportedly believe, a collapse of a material object leads to a temporary apparent horizon but not to an eternal event horizon. In its turn, pure algebra gives us clearer

confirmations in this regard: algebraically, the time-rate and the radius of a void particle, being irrational numbers, can be combined infinitely often, thus providing a theoretical opportunity for unending information exchange inside a ‘black hole’, which is associated with mutual correlation of algebraic quantities referred to as ‘alpha’ and ‘omega’. If the information exchange runs in the order which is considered to be favoured by nature then every consecutive decimal digit arising via this quantum motive implies a new degree of freedom, leading to escape from darkness.

Thus, the universe as a whole cannot reach an absolutely uniform state that makes information exchange ultimately impossible. This corresponds to the third law of thermodynamics, which states that no refrigerator can reach absolute zero (null, to be correct), that is, there is no force in the universe that can destroy information linked to void; consequently, when it is claimed that information is completely lost this means that the information is identically lost ($\propto |0_w\rangle$). The second law states that the total amount of entropy in a closed system can only increase, or, in the limit of an absolute reversible process, remain constant. This research describes the universe as a quasi-isolated system, in which gravity always compensates entropic effects as applied to ordinary matter: in a continual alternation it is created and annihilated; as for information, it cannot be physically annihilated; so if accumulated information can no longer be linked to matter, it can only be linked to void (which arises from and gives rise to information conservation principle). The first law, as current physics formulates it, states the conservation of the total amount of matter and energy; the model proposed describes the preservation of physical transformations in terms of the symmetry inherent in the attractor, which is manifest, physically, in the conservation of the angular momentum of the electron thus ensuring the entropy-gravity congruence underlying the conservation of the universal force at both absolute and elementary scales of the universe. On the basis of these claims, it may be argued that it is precisely the concept of gravity suggested here that allows us to describe the fundamental physical laws in terms of universal invariance, which reads as follows: causal oneness determines the invariability of mechanical transformations in terms of both time and space.

18. Concluding remarks

Seeking as it does to gain a deeper insight into the nature of gravity, the research has yielded certain conclusions to be highlighted. First, all objects of the universe are related to each other through the point of equilibrium; these relations are organized in agreement with the conservation laws, which ensure the spatial, temporal, and logical integrity of the universe. Second, the model proposed allows us to reveal the analytical relation describing the principal scheme of the fundamental interactions, and deduce a system of natural dimensionless units based on one, and only one, invariant—the radius of the void particle. Third, gravity is considered to be quantum information underlying structure, dynamics, and the conservation of time-space; time is considered to be a quantified measure of the evolutionary pathway between the two unique (initial and boundary) states of the universe; gravity is manifest in the inverse modality that permeates the whole of the existence of the universe. Fourth, the universe can be considered to be a holistic fractal symmetric-asymmetric open-closed self-referential quasi-continuum, which can be completely described in terms of dimensionless quantities guided by causality, which is manifest in the physical laws of conservation arising from the initial conditions specified in terms of the radius of the void particle based on ω .

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