The Origin and Fate of the Cosmos and Universes and the Classical-Quantum Asymmetry

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Abstract: Using the lacking part of ultimate theory, i.e. the Scale-Symmetric Theory (SST), the most fundamental laws of physics are formulated. The physical properties of the inflation field lead to conclusion that only not numerous mathematical formulae and equations can be realized by Nature and it concerns all possible cosmoses. Here we calculated the mass, the present-day radius and initial radius of our internal Cosmos and we pointed the phenomena that are responsible for the classical-quantum asymmetry. The all 7 types of interactions appeared due to the succeeding phase transitions of the inflation field (of the non-gravitating superluminal Higgs field) so there is not in existence some unification energy. A simulation of our Cosmos by a quantum computer is impossible. Presented here cosmology is not a speculative. It follows from the coherent SST that leads to the physical and mathematical constants in physics and to a thousand basic theoretical results consistent or very close to experimental data.

1. Introduction

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [1A]. On the other hand, the Scale-Symmetric Theory (SST), [1], shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes [1A]. Due to the saturation of interactions via the Higgs field and due to the law of conservation of the half-integral spin that is obligatory for all scales, there consequently appear the superluminal binary systems of closed strings (the entanglons) responsible for the quantum entanglement, stable neutrinos and luminal neutrino-antineutrino pairs which are the components of the luminal Einstein spacetime (it is the Planck scale), cores of baryons, and the cosmic structures (the protoworlds) that evolution leads to the dark matter, dark energy and expanding universes [1A], [1B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguish particles from their antiparticles [1A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [1A]. Sizes of pieces of space depend on their velocities [1A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [1A]. Cosmoses composed of universes are created because of collisions of big pieces of space [1A], [1B]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field)

transformed partially into the luminal Einstein spacetime [1A]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [1A], [1B].

Due to the symmetrical decays of bosons on the equator of the core of baryons, there appears the atom-like structure of baryons described by the Titius-Bode orbits for the nuclear strong interactions [1A].

Due to the initial collision of two big pieces of space and the partial transformation during the inflation of the inflation field into the luminal Einstein spacetime, there appeared two boundaries of our Cosmos one for the Higgs field and the second for the luminal Einstein spacetime [1A], [1B].

The total mass, the present-day radius and initial radius of our internal Cosmos we calculated already in paper [1B] on the assumption that gravitational pressure inserted on a single neutrino on surface of the Einstein spacetime cannot be higher than the dynamic pressure inside it. We obtained following results $M_{Cosmos} \approx 5.870 \cdot 10^{119}$ kg, $R_{Cosmos} \approx 2.334 \cdot 10^{30}$ m and $R_{Initial\text{-}of\text{-}inflation\text{-}field} \approx 1.19 \cdot 10^{11}$ m – this radius is close to the radius of the orbit of the Venus. Here we calculated these quantities applying new method.

Define the basic terms.

The Infinity: It is the infinite truly empty volume filled with the internally structureless or porous pieces of space. Sizes of the pieces of space can be from infinitesimal to at will big but they cannot be equal to zero or infinite because in such transitions the Infinity loses information. The Infinity is eternal and due to the elastic or/and inelastic collisions of the porous, or not, pieces of space we can define local units of time.

Our/the Cosmos: The two-component spacetime surrounded by two boundaries i.e. by the liquid-like boundary composed of pieces of space that is impermeable for the non-gravitating superluminal Higgs field and by the boundary composed of the entangled neutrino-antineutrino pairs (they are the two shortest-distance quantum entanglements [1A]) that is impermeable for the luminal Einstein spacetime. Of course, we must add the internal radiation and universes also.

Our/the Universe: The expanding dark energy and dark matter (i.e. the field composed of additional neutrino-antineutrino pairs [1B]) together with radiation and matter so it contains our Galaxy as well.

Local unit of time: The mean time between the local collisions of the tachyons.

Non-gravitating superluminal Higgs field: It is the field composed of tachyons. In our Cosmos the dynamic pressure of the fundamental spacetime is tremendous – it is about 10^{180} Pa [1A].

The ground state of the Einstein spacetime: It is the field composed of the neutrino-antineutrino pairs [1A]. In our Cosmos the dynamic pressure of the Einstein spacetime is about 10^{45} Pa [1A].

Here as well we listed the fundamental laws of physics that follow from the Scale-Symmetric Theory and we described the phenomena responsible for the classical-quantum asymmetry.

2. The fundamental laws of physics

2.1

At the beginning of inflation there can appear stable circles/vortices composed of the pieces of space. Such is the origin of a spin. When components of inflation field rotate then the circles have internal helicity. ***Since total spin and internal helicity of the gas must be equal to zero so the circles appear as the groups of four circles*** (the quadrupole symmetry). They are the binary systems of binary systems of circles. In a binary system of circles the spins are

parallel and their directions overlap whereas the internal helicities are opposite [1A]. In a quadrupole, the spin of the second binary system of circles is opposite and the directions of the spins of the binary systems of circles do not overlap. Number of pieces of space in a circle strictly depends on properties of the inflation field [1A].

2.2

The saturation of the interactions of the circles via the free pieces of space leads to phase transitions i.e. when the circles consist of X pieces of space then the next bigger object must contain X^2 bound pieces of space whereas the next bigger X^4, and so on [1A].

2.3

The bigger objects take over the properties of the smallest circles i.e. their spin and internal helicity.

2.4

Stability of the bigger and bigger objects is higher when Nature can quickly repair the damages to the objects. It is when mass surface-density of all the objects is the same [1A]. This law and the law **2.3** lead to ***constancy of the half-integral spin of the objects created due to the phase transitions of the Higgs field***.

2.5

The laws 2.3 and 2.4 cause that the bigger and bigger objects are the tori [1A]. They should appear as the groups of four tori of the same size. If we neglect the size of the pieces of space in comparison to the sizes of the tori then distance of the tori in a binary system is close to $2\pi R/3$, where R is the maximum distance between the centre of a torus and its surface [1A]. The distance of the binary systems in a group is close to $2\pi R$ [1A].

2.6

In very high temperature, if it is possible, symmetrical decays of particles take place [1A]. It leads to the atom-like structure of baryons [1A].

2.7

All broken-symmetries follow from the internal helicities and spins of the fundamental circles and the tori produced in the phase transitions of the non-gravitating Higgs field.

2.8

The tremendous dynamic pressures of the Higgs field and Einstein spacetime lead to the law of conservation of dynamic pressures of these fields in our Cosmos.

2.9

Due to the properties of pieces of space, there is obligatory the law of conservation of the inertial mass.

2.10

The protoworlds produce tremendous number of the precursors of the DNA codes composed of the Einstein-spacetime components. There are the four different stable components of the Einstein spacetime so such production is possible. Only not numerous precursors of the DNAs are useful because only not numerous precursors can lead to correctly functioning organisms. We can say that the statistics of tremendous number of the precursors

causes that the universes (produced by the protoworlds) are fitted for life. Just life is written down into the fundamental laws concerning the protoworlds.

3. Mass, present-day radius and initial radius of our Cosmos and the next fundamental law of physics

In incompressible fluid dynamics, dynamic pressure $p_{dynamic}$ of a fluid with density ρ and speed v is given by [2]

$$p_{dynamic} = \rho\, v^2 / 2. \tag{1}$$

where ρ is the fluid density whereas v denotes the fluid velocity.

In fields with very high dynamic pressures, pressure in each point of a vortex must be the same. The same concerns the resultant speed of components of the fields. In spinning stable torus, the spin speed v_{spin} decreases when radial distance from centre of the torus decreases. Since the resultant speed of components must be conserved so there appears the radial speed v_{radial} of the components. Since the spin and radial velocities are perpendicular so we obtain following formula

$$v_{spin}^2 + v_{radial}^2 = const. \tag{2}$$

In formulae (1) and (2) there is the square of a speed so we can separate the spin dynamic pressure from the radial dynamic pressure

$$p_{total,dynamic} = p_{spin,dynamic} + p_{radial,dynamic} = \rho\, v_{spin}^2 / 2 + \rho\, v_{radial}^2 / 2 = const. \tag{3}$$

The radial speed increases when the radial distance $r \rightarrow 0$. It causes that in centre of a spinning stable torus appears a ball/condensate in which mass density can be a little higher than the mean mass density of fields in which the torus is created. The weak interactions of the Einstein-spacetime components cause that, for example, in the centre of the core of baryons there is the stable ball responsible for the weak interactions of baryons [1A].

3.1

In centres of tori, produced due to the succeeding phase transitions of the Higgs field, is a ball/condensate.

Formula (3) leads to conclusion that when there is a change in spin speed Δv_{spin} then there is a change in mass density $\Delta\rho$

$$p_{spin,dynamic} = \Delta\rho\, (\Delta v_{spin})^2 / 2 = const. \tag{4}$$

For decreasing radial distance, the spin speed decreases as well whereas mass density increases. For the maximum radial distance in a vortex/torus, the spin speed is equal to the resultant speed of the components of the vortex/torus whereas for $r = 0$ is zero. This means that $\Delta v_{spin} = v_{components}$ so we can rewrite formula (4) as follows

$$\Delta\rho\, (v_{components})^2 / 2 = const. \tag{5}$$

The local changes in mass density in the Einstein spacetime follow from the weak interactions [1A]. To create the Protoworld (its radius is approximately 286.7 million light-years [1B] i.e. about $2.712 \cdot 10^{24}$ m) that had produced the expanding our Universe [1B], the local changes in mass density of the Einstein spacetime must be approximately $1.545 \cdot 10^{16}$ kg/m^3 – this value follows from the mass of a neutron and the range of the strong interactions about 2.958 fm [1A]. The ratio of such local changes in mass density to mass density of the Einstein spacetime (it is approximately $\rho_{Einstein\text{-}spacetime} = 1.1022 \cdot 10^{28}$ kg/m^3 [1A]) is about $1.402 \cdot 10^{-12}$ so from formula (5) and the law **2.8** we obtain that the changes in spin speed are about $1.184 \cdot 10^{-6} c$ i.e. 354.89 m/s. We can see that the changes in spin speed of the Einstein spacetime components, which are moving with the speed of light c, are the acoustic speeds so we can say that to create the protoworlds there are needed the acoustic fluctuations in the Einstein spacetime.

For the objects created due to the succeeding phase transitions is obligatory the law **2.4**

$$m \, \Delta v_{spin} \, r_{maximum} = const. \tag{6}$$

Applying the law **2.9** and knowing that $\Delta v_{spin} = v_{components}$, we obtain

$$X = v_{components} \, r_{maximum} = const. \tag{7}$$

For the neutrinos composed of the binary systems of closed strings (entanglons) [1A] we obtain $X = 0.813034 \cdot 10^{33}$ m^2/s whereas for the dark matter inside a protoworld [1B] (the maximum radius is 286.7 million light-years i.e. $2.712 \cdot 10^{24}$ m; the speed of light is $2.99792458 \cdot 10^8$ m/s [1A], [1B]) $X \approx 0.813 \cdot 10^{33}$ m^2/s as well.

Knowing the X, we can calculate the radius of our Cosmos. The Cosmos consists of the protoworlds and to create them there are needed the acoustic changes in spin speed of the Einstein-spacetime components i.e. $v_{components} = 354.89$ m/s. Applying formula (7) we obtain the radius of our Cosmos $R_{the\text{-}Cosmos} = 2.29 \cdot 10^{30}$ m.

In our Cosmos dominates the mass density of the Einstein spacetime and it is approximately $1.1022 \cdot 10^{28}$ kg/m^3 [1A]. The assumption that the inner surface of the timeless boundary of our Cosmos is a sphere leads to the mass of the Cosmos (without the inertial mass of the timeless boundary of our Cosmos) equal to $M_{the\text{-}Cosmos} = 5.55 \cdot 10^{119}$ kg. The inertial-mass density of the tachyons is $\rho_{tachyon} = 8.3219 \cdot 10^{85}$ kg/m^3 [1A] so the initial radius of the Cosmos was $R_{initial\text{-}of\text{-}the\text{-}Cosmos} = 1.17 \cdot 10^{11}$ m (1 AU $\approx 1.5 \cdot 10^{11}$ m) i.e. approximately the radius of the orbit of Venus.

We can see that during the inflation the size of our internal Cosmos increased approximately $f = 2 \cdot 10^{19}$ times whereas size of the volume filled with the dark matter increased about 72.56 times only [1B]. This means that the observed expansion of our Universe was separated in time from the inflation of our Cosmos. The exact value of f we obtain from following formula

$$f = (\rho_{tachyon} / \rho_{Einstein\text{-}spacetime})^{1/3} = 1.962 \cdot 10^{19}. \tag{8}$$

Notice that this value is very close to $2/R_N = 1.985 \cdot 10^{19}$, where R_N is the Reynolds number for the maximum dense Higgs field [1A].

The range of gravitational field is $2 \cdot 10^{36}$ m [1A] > $R_{the\text{-}Cosmos} = 2.29 \cdot 10^{30}$ m so to eliminate destruction of the gravitational field, the inner surface of the boundary of our Cosmos must be rough. Then, the trajectories of the tachyons after collision with the boundary are not convergent.

4. The fate of the Cosmos and universes

Our Cosmos can be destroyed only due to creation of a gap in the boundary composed of the pieces of space. It can happen due to a very energetic collision of the boundary with an external big piece of space. A gate in the boundary will change the conditions that led to the phase transitions and next to life.

The Einstein spacetime cannot collapse because gravitational pressure is lower than dynamic pressure.

The irreversible processes during the inflation caused that Gravity is separated from the Standard-Model interactions so unification of these two theories within the same methods is impossible.

Our Universe will expand and sooner or later the matter will annihilate because of collisions with antimatter in other universes.

Due to the big fluctuations in the luminal Einstein spacetime, there are created new universes.

5. The origin of the classical-quantum asymmetry

The tachyons, entanglons and neutrinos (so the neutrino-antineutrino pairs as well) are the classical objects. Moreover, the neutrinos are the non-relativistic objects i.e. their mass does not depend on their velocities.

But when the Einstein-spacetime components are entangled and/or confined then there can appear the quantum effects i.e. objects that can disappear in one place and appear in another one, and so on. Such behaviour leads to the wave functions. But density of some object can be much higher than density of Einstein spacetime and fields – then, the quantum behaviour is impossible.

Time is going in different way for classical and quantum parts of nucleons so there is not in existence coherent description of nucleons via equations containing only classical or only quantum time. The incoherent descriptions must contain approximations, mathematical tricks and free parameters to fit theoretical results to experimental data.

For example, the core of baryons behaves as a classical objects but it produces quantum objects. So to the core we can apply the classical formula for the spin

$$M_{o,C} \, (2 \, \pi \, r \, / \, \tau_{o,C}) \, r = \hbar \, / \, 2, \tag{9}$$

where $\tau_{o,C}$ is the period of spinning whereas $M_{o,C} = 727.44$ MeV. We can see that for constant radius, when mass of a classical object increases then period of spinning increases as well.

In the Quantum Mechanics, for loops in the rest, we must apply the Uncertainty Principle

$$M_{o,Q} \, c^2 \, \tau_{o,Q} = \hbar, \tag{10}$$

where $\tau_{o,Q}$ is the period of spinning. We can see that when mass of a quantum loop increases then period of spinning decreases i.e. the time is going in different way for classical and quantum objects.

Since the spin speed of the quantum loops is c then $2\pi r / c = \tau_{o,Q}$ so from formulae (9) and (10) we obtain

$$\tau_{o,C} / \tau_{o,Q} = (M_{o,C} / M_{o,Q}) / \pi. \quad (11)$$

The neutrinos and the cores of baryons are the classical objects whereas the large loops responsible for the nuclear strong interactions that are produced by the cores of baryons are the quantum particles [2A]. Since mass of the charged core of baryons is $M_{o,C} = 727.44$ MeV whereas of the large quantum loop responsible for the nuclear strong interactions of the hadrons is $M_{o,Q} = 67.544$ MeV, [2A], so for resting core of baryons (it is the spinning torus plus the ball/condensate in its centre [2A]) the classical time is going $R = 3.428$ times slower than the quantum time. The classical time is understood here as a mean time for the spinning torus and non-spinning ball/condensate i.e. the R is calculated on the assumption that whole mass of the core of baryons is spinning and placed in distance $2A/3$ i.e. the mass of the core is placed on the large loop.

We can see that in reality, the baryons are a mixture of classical and quantum objects so the Standard Model (SM) is the incomplete theory. On the other hand, due to the irreversible processes during the inflation, the classical General Theory of Relativity (GR) that describes the gravitational fields (they are the gradients in the non-gravitating Higgs field) is separated from the quantum Standard Model (SM) that describes the electromagnetic, nuclear strong, and weak interactions (they are associated with the gravitating luminal Einstein spacetime). It leads to conclusion that we cannot unify GR and SM within the same methods. We can unify these theories only partially via the succeeding phase transitions of the Higgs field.

SST shows that there are 7 different types of interactions i.e. the dynamic viscosity of tachyons, the directional quantum entanglement that results from the exchanges of the entanglons between the Einstein-spacetime components and neutrinos, the volumetric confinement of the Einstein-spacetime components, gravity, electromagnetism, the nuclear strong interactions and the weak interactions.

6. Computer simulation of the Cosmos

To simulate our internal Cosmos we need approximately 10^{226} tachyons/points. Moreover, the tachyons communicate themselves with speed $2.4 \cdot 10^{97}$ m/s [1A] i.e. $8 \cdot 10^{88}$ times higher than the speed of light c.

On the other hand, the computers are built of the neutrino-antineutrino pairs so the definition of picture cannot be higher than the Planck scale and the points cannot communicate with speed higher than c.

It leads to conclusion that the lower limit for size of a computer simulating the internal Cosmos should be about $(10^{226})^{1/3} \cdot 10^{-35}$ m $\approx 10^{40}$ m i.e. should be much bigger than the internal Cosmos. Moreover, simulated processes would be much, much too slow to obtain a result in a real time.

7. Summary

Here, using the lacking part of ultimate theory, i.e. the Scale-Symmetric Theory (SST), the most fundamental laws of physics are formulated.

The physical properties of the inflation field lead to conclusion that only not numerous mathematical formulae and equations can be realized by Nature and it concerns all possible cosmoses.

Here we calculated the mass, the present-day radius and initial radius of our internal Cosmos: $M_{the\text{-}Cosmos} = 5.55 \cdot 10^{119}$ kg, $R_{the\text{-}Cosmos} = 2.29 \cdot 10^{30}$ m and $R_{initial\text{-}of\text{-}the\text{-}Cosmos} = 1.17 \cdot 10^{11}$ m.

We pointed the phenomena that are responsible for the classical-quantum asymmetry.

The all 7 types of interactions appeared due to the succeeding phase transitions of the inflation field (the non-gravitating superluminal Higgs field) so there is not in existence some unification energy.

A simulation of our Cosmos by a quantum computer is impossible – size of such computer should be bigger than the internal Cosmos and communication between smallest points would be much, much too slow to obtain a result in a real time.

Presented here cosmology is not a speculative. It follows from the coherent SST that leads to the physical and mathematical constants in physics and to a thousand basic theoretical results consistent or very close to experimental data.

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