Is the Physical World the Math/Platonic-World Only?

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Abstract: Mathematical states of the infinite cosmos should be preferred as the initial conditions. Creation of physical world is impossible without two different ground states. In the limit we obtain grainy mathematical spacetime with grains composed of infinite sets of finite velocities of sizeless points placed in (true) nothingness. Such model is coherent for nontransparent grains. Can the mathematical grains be nontransparent? Probability that we cannot formulate coherent mathematical theory of Nature without plenums moving in nothingness is very high. Existence of the plenums causes that in the limit we do not lose information about inertial mass. Next, due to the inertial mass directly proportional to volume of the grains of velocities, we can replace densities by dimensionless numbers i.e. there is possible the transition from the dynamical quantities to kinematical ones. Can be the infinite physical cosmos built from mathematical objects only? What is the transition from math to physics? What are the moving pieces of space? What is the origin of their inertia? What is the origin of the critical/Planck values? Is there a lower limit for the General Relativity and Quantum Physics? Do we need new physics?

1. From physical cosmos to mathematical space composed of velocities and vice versa

According to the Dogon Myth, at the beginning there is “bummo”/a-concept-only. At the second stage there is “yala”/corner-stones, then “tonu”/more-stones and next “toymu”/completion-of-a-physical-structure [1]. Is indeed physical world built from mathematical objects? Is it possible?

There are two possibilities for existence of Nature: either the moving pieces of space, whole Nature is built of, are physical and eternal or they are some mathematical objects. Here we will discuss the second possibility i.e. a creation of matter and energy from mathematical objects.

The General Relativity leads to the non-gravitating Higgs field composed of tachyons [2A]. On the other hand, the Scale-Symmetric Theory (SST) shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes [2A]. 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 (entanglons) responsible for the quantum entanglement (it is the quantum-entanglement scale), stable neutrinos and luminal neutrino-antineutrino pairs which are the

components of the luminal Einstein spacetime (it is the Planck scale), cores of baryons (it is the electric-charges scale), and the cosmic structures (protoworlds; it is the cosmological scale) that evolution leads to the dark matter, dark energy and expanding universes (the "soft" big bangs) [2A], [2B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [2A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [2A]. Sizes of pieces of space depend on their velocities [2A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [2A]. Cosmoses composed of universes are created because of collisions of big pieces of space [2A], [2B]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the luminal Einstein spacetime (the big bang) [2A], [2B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [2A], [2B].

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 [2A].

Applying 7 parameters only and a few new symmetries we calculated a thousand of basic physical (and mathematical) quantities (there are derived the physical and mathematical constants as well) consistent or very close to experimental data and observational facts (http://vixra.org/author/sylwester_kornowski). In SST there do not appear approximations, mathematical tricks, and free parameters which are characteristic for the mainstream particle physics and mainstream cosmology.

There is the upper limit for speed of gravitational mass – it is the speed of light in "vacuum" c and it follows from the formula applied in the General Relativity (GR) for the total energy E of a Principle-of-Equivalence particle (i.e. its inertial mass is equal to gravitational mass)

$$E = m c^2 / sqrt(1 – v^2 / c^2), \quad (1)$$

where v is the kinetic speed of the particle.

Assume that the speed c is the threshold for the transition from the Principle of Equivalence to the inertial mass only i.e. to objects which do not produce gravitational or other fields. Next, we will test whether such objects can indeed be inertial i.e. whether their properties lead to the first principle of dynamics (the Newton's first law of motion).

Since for $v > c$ the inertial masses cannot produce any field so neglecting the direct collisions, they have broken contact with the Principle-of-Equivalence particles. We can say that they are the imaginary objects so their imaginary/inertial-only mass can be defined as follows

$$m_{inertial} = i\, m = m\, sqrt(–1). \quad (2)$$

For $v >> c$ (the tachyons in SST), applying formulae (1) and (2), we obtain

$$E_{tachyon} = m_{inertial}\, c^3 / v. \quad (3)$$

We can see that energy of a tachyon decreases when its speed increases. How it is possible? Consider a gas composed of tachyons with constant total inertial mass (i.e. with constant total volume of the tachyons/pieces-of-space everything is built of) but with increasing total energy. It means that mean kinetic speed of tachyons increases so due to the direct collisions there appears the grinding of them i.e. number of tachyons increases whereas their mean

inertial mass/volume decreases. This leads to conclusion that energy of individual tachyons decreases with increasing kinetic speed whereas total energy of the gas increases. Since inertial mass density, $\rho_{inertial}$, is constant so dynamic pressure, p_{dyn}, of the gas increases as well

$$p_{dyn} = \rho_{inertial}\, v^2. \tag{4}$$

From formula (3) results that in the limit $v \rightarrow \infty$, energy of each mathematical object is equal to zero so the total energy should be equal to zero as well. It suggests that in the limit we lose information about inertial mass. But it is true only partially – there appeared the mathematical space composed of infinite number of infinite velocities of sizeless points which distribution can change. But most important is the fact that there appeared the mathematical indeterminate form

$$\textit{Infinite number of infinite velocities of sizeless points } (\infty \cdot 0). \tag{5}$$

The sum of all velocities is equal to zero.

The mathematical space composed of the infinite velocities of sizeless points could be the first ground state of the infinite cosmos but there disappears information about inertial mass/volume. Probability that we cannot formulate coherent mathematical theory of Nature without infinitesimal plenums (there can be no motions in an infinitesimal plenum because it is completely full) moving in (true) nothingness is very high. Existence of the plenums causes that in the limit we do not lose information about inertial mass.

Why probability of existence of the infinite cosmos in its first ground mathematical state is practically equal to zero? Kinematical pressure we can define as follows

$$p_{kin} = v^2. \tag{6}$$

From formula (6) results that kinematical pressure of the mathematical space composed of infinite number of the infinite velocities of sizeless points is infinite i.e. the infinite kinematical pressure tries to tear the mathematical space to the moving pieces. According to the mathematical indeterminate form, sizes of the pieces are arbitrary

$$\infty \bullet 0 = a \textit{ (arbitrary value).} \tag{7}$$

We can see that there appear pieces with different sizes each composed of parallel finite velocities i.e. inside the pieces there is the order in linear/parallel motions.

Such order decreases the kinematical pressure i.e. the grainy state of the mathematical space is much more probable than its first ground state.

The volume between the pieces of mathematical space is the true nothingness free from the velocities. It is the second ground state of mathematical space. It consists of geometric points. In modern mathematics, the geometric points do not have any length, area, volume, or any other dimensional attribute. A point is not a thing – a point is an exact position. This leads to conclusion that kinematical pressure of nothingness is equal to zero. But emphasize that the pieces of mathematical space composed of infinite sets of

finite velocities of sizeless points must be nontransparent – then, the information about inertial mass is not lost.

We can see that due to the infinite kinematical pressure of the first ground state of the mathematical space composed of infinite velocities of sizeless points, due to the mathematical indeterminate form (formula (7)), and due to the fact that information cannot be lost, existence of grainy mathematical space is inevitable. But can they be nontransparent? If not then eternal infinitesimal physical plenums must be in existence for a certainty.

There is the kinematical viscosity of the pieces of space. Kinematical viscosity, η, is defined as a product of a typical length scale, L, in the system and speed of a layer, u, divided by Reynolds number, R

$$\eta = L\, u / R. \tag{8}$$

There are as well the motions of the pieces of space (so there appears the time) in the true nothingness. The simplest formulae applied in the dynamics of fluids [2A], and the Kasner solutions to the vacuum Einstein equations [3], lead to the Einstein-spacetime components (i.e. to the neutrino-antineutrino pairs) i.e. to the structures characteristic for the speed of light in "vacuum" c [2A].

In SST, a tachyon is a classical, non-relativistic ball without a field so its inertial mass is positive. We can use the field composed of tachyons and its phase transitions to describe spontaneous symmetry breaking and creation of quantum fields.

We can say that the fact that information cannot be lost is the Holy Grail of our existence.

2. The transition from dynamic quantities to kinematical ones

The inertial mass of the pieces of spacetime $M_{inertial}$ (the pieces are moving so there appears the time) is directly proportional to their volume, V. Due to the substitution $M_{inertial} \rightarrow V$, the inertial mass density of the pieces is equal to 1. Then, the other mass densities are the dimensionless numbers. We can define the dynamical quantities in such a way that there appears a mass density and next we can replace the mass density by a number. In such a way we obtain definitions for kinematical quantities. For example, we can compare formulae (4) and (6) for, respectively, dynamical and kinematical pressures.

Define dynamical surface tension, γ_{dyn}, for spherical piece of spacetime

$$\gamma_{dyn} = \rho_{inertial}\, v^2\, r, \tag{9}$$

where r is the radius of the spherical piece. Due to the substitution $\rho_{inertial} = 1$, we obtain the definition for kinematical surface tension

$$\gamma_{kin} = v^2\, r. \tag{10}$$

Using this formula and knowing the properties of the tachyons in our Cosmos [2A], we can calculate their kinematical surface tension (about $3 \cdot 10^{130}$ m^3/s^2).

Velocity v depends on radius of the spherical pieces. Assume that v is inversely proportional to maximum cross-section of the spheres. This leads to conclusion that kinematical surface tension is inversely proportional to volume of the sphere i.e. for infinite size is equal to zero whereas for sizeless point is infinite. We obtain that nothingness contains sizeless points with infinite tension. What is an interpretation of such strange result? Can truly

empty volume oscillate between infinite nothingness and sizeless point? Can sizeless point have infinite tension? What there oscillates? Can size of the spheres depend on local energy density?

These questions suggest that there are two states of points i.e. the abstract state (the true nothingness contains abstract mathematical objects) and the non-sizeless points/things with tremendous surface tension. Is there a mechanism which leads to the lower limit for radius of such physical points?

3. The origin of inertia

Notice that the strictly defined parallel velocities in a piece of space are invariant because it is moving in the true nothingness. Only in the direct collisions, the finite velocities in the piece can increase or decrease, i.e. to change velocity of the piece there are needed interactions. Such is the origin of the inertia of the inertial-mass-only pieces of space i.e. the inertia concerns the inertial mass. For the Principle-of-Equivalence particles, the inertial mass is equal to their gravitational mass so the Newton's first law of motion concerns such particles as well.

4. The origin of the critical Planck values and the limitations for the General Relativity (GR) and the Quantum Physics (QP)

The Planck mass (about $2.18 \bullet 10^{-8}$ kg) does not concern the rest mass of a particle. It concerns the maximum rotational energy of the Einstein-spacetime components. The structure of such components (the two tori with parallel and overlapping directions of spins) and its rotation is described within SST [2A]. The maximum distance between symmetric points on the two tori is $2R_L = 2\,(\pi + 1)\,r / 3$, where $r = 1.1184555 \cdot 10^{-35}$ m is the equatorial radius of the tori, and $2R_L$ is the diameter of a loop which circumference is equal to the length of a wave λ. From formula $M_{critical}\,c^2 = h / T = h\,c / \lambda$ we obtain

$$M_{critical} = h / (\lambda\, c) = h / (2\,\pi\, R_L\, c) = 3\,\hbar / \{(\pi + 1)\, r\, c\} \approx 2.28 \cdot 10^{-8} \text{ kg}. \qquad (11)$$

This value is close to the Planck energy. This energy is associated with rotation of the two tori. Their volume is equal to $V = 8\pi^2\, r^3 / 27 \approx 4.0915 \cdot 10^{-105}$ m^3 so the calculated critical energy density is

$$\rho_{critical} = M_{critical} / V \approx 5.57 \cdot 10^{96} \text{ kg/m}^3. \qquad (12)$$

This value is close to the Planck density (about $5.16 \cdot 10^{96}$ kg/m^3). The obtained results are not exact because the Planck values concern an abstract cube, not a binary system of tori.

In the definitions of the critical values and in the main theories, i.e. General Relativity (GR) and Quantum Physics (QP), there appear the physical constants, for example, the speed of light in "vacuum" c. It leads to conclusion that the structures with sizes $2r < 2.24 \cdot 10^{-35}$ m that appear in SST are beyond the GR and QP i.e. to describe such structures we need new physics and the Scale-Symmetric Theory is the lacking part.

5. Summary

Probability that we cannot formulate coherent mathematical theory of Nature without infinitesimal plenums (there can be no motions in an infinitesimal plenum because it is completely full) moving in (true) nothingness is very high. Existence of the plenums causes that in the limit we do not lose information about inertial mass.

The infinite cosmos needs the infinitesimal plenums to get rid of the infinite kinematical pressure which follows from infinite speeds of sizeless points. We could solve this problem if there is some phenomenon in which pure kinetic speed (i.e. inertial mass is equal to zero, i.e. physical volume is equal to zero) can transform into physical volume. Such process is impossible within known physics so we must assume that plenums are eternal. But then there still is not answered following question: Why there exist the physical/nontransparent plenums? Is such a question meaningless? Or maybe they are some mathematical objects? Can some mathematical objects (for example, infinite set of finite parallel velocities of sizeless points) be nontransparent? **Can volume be an illusion, i.e. can infinite velocity of sizeless point transform into nontransparent infinite set of finite velocities of sizeless points?** Such model has two weak points because our intuition suggests that the velocities of sizeless points and the nontransparent mathematical grains cannot be real things. Are the eternal nontransparent infinitesimal plenums only the possible solution?

Notice as well that value of the inertial-mass-only density is not important – we can define the inertial-mass-only as equal to its volume – then such density is dimensionless and equal to 1.

In the limit, we obtain grainy spacetime of velocities of sizeless points placed in (true) nothingness. Next, due to the inertial mass directly proportional to volume of the grains of velocities, we can replace densities by dimensionless numbers i.e. there is possible the transition from the dynamical quantities to kinematical ones.

Properties of the fundamental spacetime lead to the origin of inertia.

The Planck mass does not concern the rest mass of a particle. It is the maximum rotational energy of the Einstein-spacetime components.

Invariance of the physical constants applied in GR and QP leads to the limitations for these theories – structures with sizes smaller than about $2.24 \cdot 10^{-35}$ m, are beyond the GR and QP i.e. to describe such structures we need new physics and the Scale-Symmetric Theory is the lacking part.

References

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