In Theory of Everything Simplicity Does Not Compete with Accuracy

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Abstract: Can we guess the initial conditions for the Theory of Everything (ToE)? We understand such initial conditions as a set of all parameters, initial symmetries, and initial equations. Initial symmetries and initial equations can point possible phase transitions which can lead to additional symmetries and additional equations called here the additional conditions. Such additional conditions result from initial conditions so they do not decrease consistency of theory. On the other hand, appearing anomalies in a theory that cannot be explained within initial and additional conditions, always lead to new/free parameters. Free parameters need ad hoc hypotheses (i.e. some corrections that do not result from initial and additional conditions) which always weaken the theories. Elimination of ad-hoc/free parameters by increasing number of initial conditions causes Occam's razor to be a determinant of the consistency of theories describing the same phenomena. The Occam's razor is defined as follows: "Among competing hypotheses, the one with the fewest assumptions should be selected" [1]. It means that consistency of a theory can be defined as the inverse of the number which is the sum of all parameters, initial symmetries and initial equations (the sum of elements of the three different groups of initial conditions). New symmetries and new equations, which in a natural way appear on higher levels of ToE (the Standard Model (SM) and General Relativity (GR) are the higher levels of ToE), if we know the lowest levels of ToE, do not decrease the consistency of the theory. Authors of theories add the ad hoc hypotheses to prevent them from being falsified. Such non-scientific method causes that theories become more and more complex so their consistency is lower and lower. In physics, naturalness means that the dimensionless ratios between parameters take values of order 1. Parameters varying by many orders of magnitude need so called fine-tuning symmetries. It suggests that fine-tuned theories should be more complex i.e. their consistency should be lower. But Nature shows that it is the vice versa. It leads to conclusion that fine-tuned theories are closer to ToE. Here we guessed the initial conditions for ToE, we explained why consistency of presented here ToE is highest and why it is the fine-tuned theory. The consistency factor of presented here ToE is 1/(7+5+4)=0.0625 and it is the highest possible value for ToE-like theories. Consistency factor of SM is much lower so it is the incomplete theory sometimes leading to incorrect results.

1. Introduction

Many of presented here ideas we can find in my previous papers [2] but a few are new – they concerns, especially, the derivation of the Reynolds number for the initial inflation field, the consistency factor for the ToE-like theories or the saturation symmetry which shows why ToE is the fine-tuned theory. The new ideas caused I decided on a comprehensive and coherent presentation of the foundations of ToE.

2. The four initial equations for ToE

Generally, physicists assume that Nature on its lower and lower levels is more and more complex. Such assumption is not compatible with Occam's razor. We should assume the vice versa. Then, on the lowest level of Nature, there should be only two different states of spacetime: the true nothingness and the moving, fully non-transparent pieces of space. Such pieces of space are bare i.e. they are unable to create a field(s) around them (i.e. they are non-gravitating and classical so according to ToE, gravity and quantum entanglement should emerge on higher levels of Nature). They can interact only due to the direct collisions. Such pieces of space can interact only due to dynamic viscosity of them which follows from smoothness of their surface – we know that it is very difficult to separate two sheets of glass.

The smoothness of surfaces is the source of the fifth force which in ToE is the fundamental force. All other forces/interactions can be reduced to the fifth force/interaction.

Assume that the inflation can be realized by Nature. It means that the pieces of space are superluminal (they are the non-gravitating tachyons called here tachyons) and that at the beginning of the inflation they were packed to maximum. The friction and superluminal speeds caused that tachyons are perfect balls. The non-transparency of tachyons caused that the initial inflation field was an incompressible liquid.

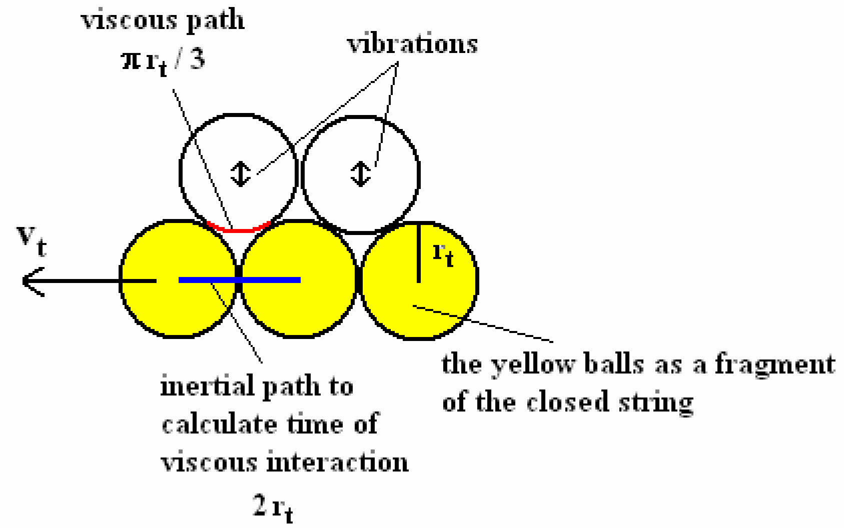

Fig.1
Behaviour of non-gravitating tachyons in the initial inflation field

To reduce the tremendous dynamic pressure inside the initial inflation field, there must be created spinning closed strings composed of tachyons. We can derive formula for radius of such closed string. Such radius should depend on the Reynolds number, R, for the initial inflation field. Reynolds number is defined as the ratio of inertial forces to viscous forces. But R concerns the same liquid so inertial acceleration is equal to viscous acceleration. It means that for the initial inflation field, R is defined as the ratio of involved inertial mass to involved viscous mass

$$R = m_{inertial} / m_{viscous} \,. \tag{1}$$

Calculate the inertial and viscous masses. The spinning closed strings have masses bigger than tachyons so the tachyons they consist of are spinning without vibrations in directions perpendicular to their spin speeds (Fig.1). On the other hand, due to the fact that the closed strings consist of perfect balls, the tachyons tangent to the closed strings vibrate (the not tangent free tachyons, i.e. the tachyons outside the closed strings, vibrate also) in directions perpendicular to the spin speeds of the tachyons in the closed strings. The fact that the tachyons in the initial inflation field were packed to maximum causes that length of the inertial path is not equal to the viscous one (Fig.1). Calculate the masses for displacement in the closed string equal to $2r_t$ which is the size of tachyons

$$m_{inertial} = \rho_t \, V_t = \rho_t \, (4 \, \pi \, r_t^{\,3} / 3) \,, \tag{2}$$

$$m_{viscous} = \eta_t \, (\pi \, r_t / 3) \, (2 \, r_t / v_t) \,, \tag{3}$$

where ρ_t is the inertial-mass density of tachyon, V_t is volume of tachyon, r_t is its radius, η_t is its dynamic viscosity, and v_t is its speed.

Formulae (1), (2), and (3) give

$$R = m_{inertial} / m_{viscous} = \rho_t \, v_t \, (2 \, r_t) / \eta_t \,. \tag{4}$$

R is dimensionless so expression $\eta_t / (\rho_t \, v_t)$ is a radius – we can assume that it is radius of the created closed strings, r_1

$$r_1 = \eta_t / (\rho_t \, v_t) \,. \tag{5}$$

The formulae (1), (2), (3), and (5) are the 4 elements of the complete set of the initial equations in ToE. All other equations we can derive from such a set and from the listed below sets of 5 initial symmetries and 7 parameters only. Besides two parameters, all other initial conditions follow from properties of the initial inflation field. The two parameters not associated with properties of the initial inflation field follow from the fact that the final state of spacetime does not depend directly on state of the initial inflation field. Just the final state was a result of some phase transitions of the expanding inflation field which caused that at the front, at some unspecified moment, the pressure forced by the emergent gravity became higher than the dynamic pressure – the collapse created stable boundary of spacetime.

3. The five initial symmetries for ToE

A) The four—closed-string symmetry follows from the fact that internal helicity and spin of the inflation field must be conserved. The tachyons rotate so the created closed strings have internal helicity and spin. To create an object with zero internal helicity and zero spin, the closed strings must be created as binary systems of binary systems. The constituents of the single binary systems have parallel spins and opposite internal helicities whereas the binary systems in a binary system have opposite spins. Such four-object symmetry can be adopted by other objects on higher levels of Nature.

B) The saturation symmetry that follows from collisions of free tachyons and the bound tachyons in the closed strings – if a torus created due to phase transitions of the expanding inflation field consists of N bound tachyons then the next more massive one consists of N^2 bound tachyons, and so on. In Paragraph **4** we calculated number of tachyons each closed string consist of $N = K^2 \approx 10^{20}$ – it is very big number so the fragment of closed string in Fig.1 is indeed practically rectilinear. Moreover, the big number N and the saturation symmetry causes that presented here ToE is the fine-tuned theory.

C) The self-similarity of bare fermions to quasars i.e. there is central condensate surrounded by torus with internal helicity which is adopted due to the internal helicity of the closed strings (they are the fermions – see Paragraph **4**). To conserve stability of such tori, there must appear radial velocities which lead to the central condensate.

D) The invariant surface density of different tori created due to the phase transitions of the expanding inflation field so Nature can immediately repair damages to them.

E) On the higher levels of Nature, the half-integral spins of the closed strings with internal helicity and the unitary spins of the binary closed strings (we can calculate the spins from the initial conditions – see Paragraph **4**) are adopted by other particles. Tori are the simplest surfaces which can adopt the internal helicity and spin of the closed strings.

4. The seven parameters for ToE

Now knowing the 4 initial equations and 5 initial symmetries, we can define the 7 parameters in such a way to obtain theoretical results consistent with experimental data [2]. They are as follows.

Radius of tachyons must be

$r_t = 0.47571055 \cdot 10^{-64}$ m.

Linear speed of tachyons must be

$v_t = 2.386343972 \cdot 10^{97}$ m/s.

Mean speed on equator of tachyons must be

$v_{st} = 1.725741 \cdot 10^{70}$ m/s.

Inertial mass of tachyons must be

$m_t = 3.752673 \cdot 10^{-107}$ kg.

Dynamic viscosity resulting from smoothness of surfaces of tachyons must be

$\eta_t = 1.87516465 \cdot 10^{138}$ kg m^{-1} s^{-1}.

The present-day mean inertial mass density of the final inflation field (of the Higgs field) must be

$\rho_{N(HF)} = 2.645834 \cdot 10^{-15}$ kg m^{-3}.

Today this part of spacetime is classical because today from the tachyons cannot be created any particles or pairs of particles, and so on.

Mean mass density of the Einstein spacetime (it consists of the neutrino-antineutrino pairs) that emerged during the inflation must be

$\rho_{ES} = 1.10220055 \cdot 10^{28}$ kg m^{-3}.

Today the ground state of this spacetime is classical whereas the excited states of it behave as the quantum particles and such quantum particles are the components of the quantum fields.

Applying the 7 above parameters, we can calculate inertial mass density of tachyons

$\rho_t = 8.32192436 \cdot 10^{85}$ kg m^{-3}.

We can as well calculate the Reynolds number for maximum dense Higgs field (it is the initial state of the inflation field composed of tachyons)

$R = 1.0076047 \cdot 10^{-19}$,

and the radius of closed strings which can be produced due to the value of the Reynolds number

$r_1 = (2r_t) / R = 0.94424045 \cdot 10^{-45}$ m.

We can calculate the number of tachyons, K^2, a closed string consists of

$$K^2 = 2 \pi r_1 / (2 r_t) = (0.7896685548 \cdot 10^{10})^2. \qquad (6)$$

The spin of each closed string is half-integral

$$Spin = K^2 m_t v_t r_1 = \hbar / 2 = (1.054571548 \cdot 10^{-34}/2) \text{ Js}. \qquad (7)$$

Gravity and quantum entanglement emerged due to the phase transitions during the inflation – the phase transitions follow from the saturation symmetry.

The gravitational constant, G, results from internal helicity of all closed strings a neutrino consists of – the closed strings transform the chaotic motions of tachyons into the divergent motions. The collisions of the divergently moving tachyons with the chaotically moving ones produce the invariant gradient in the Higgs field i.e. produce the invariant gravitational field. On the other hand, the quantum entanglement is the result of exchanges of the binary systems of closed strings (entanglons) between neutrinos or binary systems of neutrinos.

The G we can calculate from following formula

$$G = v_{st}^4 \rho_{N(HS)} / \eta_t^{\,2} = 6.6740007 \cdot 10^{-11} \text{ m}^3/(\text{kg s}^2) . \qquad (8)$$

Applying the 7 parameters, 5 initial symmetries, and 4 initial equations, we calculated a thousand basic physical quantities (the physical constants as well) which are consistent or very close to experimental data [2].

5. Summary

Here we showed that the properties and phenomena in the initial inflation field are crucial in formulation of the initial conditions for Theory of Everything.

The consistency factor of presented here ToE is $1 / (7 + 5 + 4) = 0.0625$ and it is the highest possible value for ToE-like theories. Consistency factor of the Standard Model is much lower so it is the incomplete theory sometimes leading to incorrect results.

Due to the saturation symmetry, presented here ToE is the fine-tuned theory. Such theory has less initial conditions so according to the Occam's razor it is the better ToE-like theory. Naturalness is not characteristic for ToE.

References

[1] https://en.m.wikipedia.org/wiki/Occam%27s_razor

[2] Sylwester Kornowski
http://vixra.org/author/sylwester_kornowski