How to Eliminate the Messy Mathematical Methods from Physics and Cosmology?

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Abstract: The gauge invariance of equations follows from constancy of charges. There appear arbitrary functions so to obtain quantized values we must apply approximations, mathematical tricks and free parameters. The second messy mathematical method applied in physics follows from the wrong assumption that the bare particles are sizeless and that there are in existence interactions with infinite range (it follows from the massless carriers of interactions). In such method, to obtain theoretical results consistent with experimental data, there must appear the mathematical indeterminate forms so they are incoherent as well. Such messy method cannot be eliminated via vibrating flexible strings, as it is in the M/string theory, because such assumption cannot lead to constancy of physical constants. What we should do to eliminate the arbitrary functions, sizeless bare particles, infinite ranges of forces and flexible strings? What is the difference between microscopic and macroscopic times? We show that some extension to the General Relativity is the answer to these questions. The quantum entanglement and locally broken symmetries cause that Nature on higher and higher levels becomes more and more complex.

1. Introduction and motivation

The gauge invariance of equations follows from constancy of charges. We can say that the gauge invariance is associated with the laws of conservation of charges. Instead some vector potential A and scalar potential φ we can apply the modified quantities

$$A' = A + grad\, f, \tag{1}$$

$$\varphi' = \varphi - (1 / c)\, \partial f / \partial t, \tag{2}$$

where f is an arbitrary function.

Due to the arbitrary function, f, there is big number of solutions (big number of different gauge fields) which conserve charges. It causes that to obtain theoretical results consistent with experimental data, i.e. consistent with quantized values, there sooner or later in the gauge theories containing the arbitrary function f, must appear approximations, mathematical tricks

and free parameters. Of course, the gauge theories are partially useful because they lead to symmetries (sometimes to broken symmetries) and next to the laws of conservation. But it looks as a lucky hit, not as coherent theory. Moreover, such mathematical methods never will lead to the complete internal structures of the charges so as well to the complete internal structure of spacetime and other fields. It causes that we cannot properly/unmistakably describe the interactions of charges with spacetime and other fields. There appear many wrong assumptions and interpretations.

The second messy mathematical method applied in physics follows from the wrong assumption that the bare particles are sizeless and that there are in existence interactions with infinite range (it follows from the massless carriers of interactions). In such method, to obtain theoretical results consistent with experimental data there must appear the mathematical indeterminate forms as, for example, $\infty - \infty = arbitrary\text{-}constant$. It causes that theories with such assumptions are mathematically incoherent so there appears the mathematical trick i.e. the renormalization. Such messy method cannot be eliminate via vibrating flexible strings, as it is in the M/string theory, because such assumption cannot lead to constancy of physical constants [1A].

The General Relativity (GR) leads to the non-gravitating Higgs field composed of tachyons [1A]. 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/energies [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 (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) [1A], [1B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [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].

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.

What we should do to eliminate the arbitrary functions, sizeless bare particles, infinite ranges of forces and flexible strings?

The GR with the upper limit for speed c concerns the Principle-of-Equivalence objects i.e. objects that inertial mass is equal to gravitational mass. So the fundamental question is: Can there be in existence non-gravitational inertial-mass-only pieces of space moving with superluminal speeds? And some extension of the GR “says” YES [1A]. Just such extension leads to physical/nontransparent volumes without fields – they are the bare objects/tachyons. In SST, the field composed of the tachyons is the superluminal non-gravitating Higgs field and it was the inflation field. The kinetic and rotational energies are carried by the pieces of space so in such theory cannot appear singularities and infinite ranges – just renormalization is eliminated.

It causes that we can apply the simplest dynamics of fluids. There appear the superluminal closed strings with half-integral inertial-only spin. The half-integral spin is copied in greater and greater structures composed of more and more tachyons. Due to the half-integral spin and the saturation of interactions, the masses, radii and speeds of such structures are quantized [1A]. They lead to the internal structures of bare charges. This theory simultaneously leads to the origin of physical constant, internal structures of charges, spacetime and possible fields and finite ranges of gravity and electromagnetism. Just in this theory the all messy mathematical methods are eliminated. There do not appear singularities and infinities because the two-component spacetime is grainy.

Why range of gravitational interactions is finite? The gravitational fields are the gradients in the superluminal non-gravitating Higgs field produced by the free (i.e. there is the gravitational interaction only) and bound (bound due to the quantum entanglement and/or confinement) Einstein-spacetime components. The range is finite due to the collisions of the tachyons – it is about $2 \cdot 10^{36}$ m [1A]. Photons and gluons are the rotational energies of the Einstein-spacetime components [1A].

Why closed strings, not balls/condensates-of-tachyons?

In fluids can appear vortices/closed-strings. The tachyons rotate so the closed strings composed of tachyons have internal helicity. Balls/condensates-of-tachyons cannot have internal helicities. Just tori and physical loops are the simplest mathematical objects which can have internal helicity. To conserve the zero-internal helicity of the Higgs field, the closed strings appear as the pairs with opposite internal helicity of components of a pair. We can see that the succeeding phase transitions break local symmetries whereas global symmetry is conserved. Life needs broken symmetries.

Why not the Riemannian supermetrics? Why unification of gravity and Standard Model within quantum physics is impossible?

Due to the two first irreversible phase transitions during the inflation, the gravity that is associated with the superluminal non-gravitating Higgs field was irreversibly separated from the Standard-Model interactions associated with the luminal gravitating Einstein spacetime so unification of gravity and Standard Model within the same mathematical methods is impossible.

Why ten "dimensions" of the closed strings?

In reality, the "ten dimensions" are the degrees of freedom that describe position, shape and possible motions of a closed string composed of tachyons. We need x, y, and z to describe initial position of the centre of a closed string, its two radii, linear speed (time), toroidal speed, poloidal speed and two angular velocities to describe rotation of spin of the closed string in relation to the linear velocity and spin i.e. we need 9 spatial degrees of freedom and 1 time degree of freedom.

What is the difference between the microscopic and macroscopic times?

Usage of time-dependent equations to individual bare particle is useless. It is because behaviour of a quantum particle is non-deterministic. It is due to the fact that a quantum particle disappears in one place and appears in another one, and so on. Just the quantum physics is the statistical theory so we can say that quantum physics is deterministic only statistically. We can say only about motion of a statistical picture/object representing a quantum particle i.e. about changes in time of the wave functions. But even then the quantum time is wrongly defined. It follows from the fact that in micro-world there are produced different virtual and real pairs and different fluctuations in the Einstein spacetime that change

the local mass densities so local times (local units of time) as well. Just quantum particle has volume so we have simultaneously many different units of time concerning the same quantum particle. The solutions to time-dependent equations in the quantum physics are only approximate. Generally, such equations are useless.

So what is an alternative? We should seek the statistically stable states and we can do it considering the phase transitions – it is done within SST.

Equations dependent on time are useful only in deterministic world i.e. macro-world. It follows from the fact that dominating part of nucleons, about $100\% \cdot 727 / 939 \approx 77\%$ (the $727\ \mathrm{MeV}$ is the approximate rest mass of the core of baryons whereas the $939\ \mathrm{MeV}$ is the approximate rest mass of nucleons [1A]), at the today density of the Einstein spacetime, behaves in a deterministic way (due to the two shortest-distance entanglements, the core of baryons is practically indestructible and it cannot behave in a quantum way [1A]). But emphasize that the classical parts of nucleons produce quantum particles. But due to the classical parts, big collections of interacting atoms can behave classically i.e. we can say about their trajectories. To big collections of interacting atoms we can apply the time-dependent equations because then we can neglect the quantum fields outside the volume filled with the classical parts of nucleons.

The Schrödinger equation dependent on spatial coordinates only, leads to the statistically stable shapes of the wave functions so such solutions are correct.

We can say about the good defined relativistic time only in relation to deterministic objects.

We can use the Uncertainty Principle, which ties energy of an object and its lifetime, because it leads to statistical shape concerning the lifetime.

Why Nature on higher and higher levels becomes more and more complex?

According to the SST, our Cosmos appeared due to expansion of the inflation field that at the beginning was composed of tachyons packed to maximum and there were not their chaotic motions so entropy was lowest [1A]. But due to the collision with bigger piece of space, there appeared the succeeding phase transitions of the initial Higgs field and chaotic motions of free tachyons, [1A], so entropy increased. Moreover, there appeared the quantum entanglement and confinement of the neutrino-antineutrino pairs and fermions (they have internal helicity so they break local symmetry). In the left-handed vortices that can appear in the Einstein spacetime there is produced more the proton-electron pairs than the antiproton-positron ones – it is the locally broken symmetry. The succeeding phase transitions lead to different scales in which appear new types of interactions – SST shows that there are the 7 different interactions i.e. viscosity of tachyons, quantum entanglement, confinement, gravity, electromagnetism, weak and nuclear strong interactions [1A]. The mentioned basic phenomena cause that Nature on higher and higher levels is more and more complex.

References

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