Time runs only in the elementary particles and in black holes

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Abstract.

The author shows examples where his opinion about fundamentality is different as opinion of the majority of physicists. He claims that special relativity alone gives that time runs only in rest matter. He claims that absolutely empty spacetime without rest matter cannot exist; one reason is also because time runs only in rest matter. Existence of dimensionless masses of the elementary particles also tells us about coupling between rest matter and spacetime. Dimensionless masses of the elementary particles are obtained when the masses of the elementary particles are combined with the gravitational constant, Planck's constant and the speed of light. The author insists that the principle of equivalence remains also in quantum physics, and that gravitational uncertainty principle is simple. Consciousness is still more fundamental than the elementary particles, but consciousness does not exist outside of elementary particles. The author advocates quantum consciousness, *free-will*, and suggests how to verify this experimentally.

1. Introduction

‡ In the main part, nowadays it is a wide agreement among physicists what is fundamental in physics. Elementary particles, quantum physics, general relativity (GR), black matter, black energy, three space dimensions, big bang theory etc, are foundations of physics. Biology can also be named as a part of physics. Foundations of it are cells, mechanisms in cells, etc.

There are different opinions of the physicists at the theory of quantum gravitation, at explanation of black matter and energy, at explanations of consciousness, at existence of *free-will*, at existence of quantum consciousness, etc.

Before studying physics, I had a lot of questions about fundamental physics, but many of them were mainly clarified after the end of the study and after many years of individual studying after that. But answers were not coming directly, I made my own visualizations to obtain answers to my questions. Still visualization of the quantum field theory is waiting that one day I will understand what quantum gravity is at all.

I will tell some things which are my opinion, and they are at least a little different than the general opinion. Some things are written here, some are written in my references.

2. My different proposals for foundations of physics

I think that some essential principles in special relativity (SR), in GR, and in quantum physics will remain also in a true theory of a quantum gravitation.

- Such principle of SR is that a potentially rest elementary particle defines time,
- that spacetime absolutely without rest matter cannot exist.
- that *principle of equivalence* is valid also in quantum physics, [1, Pg 5],
- and that the principle of uncertainy is, in some way, essential in quantum physics.

The official physicists suppose that

- ◇ They defend a possible existence of absolutely empty spacetime (if even absolutely no rest matter exists). Otherwise GR would lose its meaning and *Mach's principle* would obtain its meaning.[2, 3, 4]
- ◇ They hope that the graviton exists, therefore they want to circumvent the *principle of equivalence*.[5]
- ◇ They calculate that the uncertainty principle that follows with the inclusion of gravity, is no more a simple formula.[6, 7]

I formulated the *principle of equivalence* as a principle of a rocket that is accelerated by photons that fly from it. Because of discrete nature of photons, the rocket cannot achieve uniform acceleration. Consequently, because of the *principle of equivalence*,

‡ This essay was published in FQXi contest 2018, [31].

gravitational field also cannot be absolutely uniform. But this causes a different, more simple quantum uncertainty principle for gravity.[1, Pg 6]

- Otherwise, SR alone shows that spacetime and matter are coupled and they are mutually dependent. This coupling is evident because time runs only in potentially rest matter and it runs dependently of the matter.[8, Pg 8]† At this, fundamental particles of potentially rest matter are the elementary particles and black holes.‡ Time does not run in photons, they are not potentially rest.
- This coupling is evident also because the typical constants of spacetime, c, $\hbar$ and G, form dimensionless constants with the masses of the elementary particles:([9]

$$\mu_i^2 = \frac{m_i^2 G}{\hbar c} \tag{1}$$

  At this, G means the gravitational constant, $\hbar$ means reduced Planck's constant, and c means the speed of light. Thus, the mass of i-th elementary particle m_i is written dimensionlessly as μ_i.
  Such dimensionless nature of physics is necessary for the mathematical nature of physics.[10, Pg 6]
- Besides, spacetime also loses meaning if there is no matter in it.
- One example for existence of the empty spacetime is de Sitter space.[4] But, such space is a consequence of the cosmological constant, and it is a consequence of virtual particles, therefore it is a consequence of matter.[11][12, after eq.(4.75)]
- At the same time, the dimensionless physics is a hint that we are in the right direction toward the quantum gravity theory.

Otherwise, fundamentality is also that something is told as short as possible. What is shorter is more fundamental. This means a shorter computer source code, or a shorter derivation, or more compressed data. Dimensionless physics also means more compressed data, more clear future derivation of quantum gravity theory, and, the most probably, the only possible way to derivation of a quantum gravity theory.

Thus, fundamentality is also that some aspect of a theory is derived as short as possible, although not with the common derivation. Here are some examples:

◇ The fact that γ in SR is connected with a rectangular triangle, can be derived more clearly and more similar with Newtonian physics, [8, Pg 3], than the common derivation[13].γ means

$$\gamma = \sqrt{\frac{1}{1-(v/c)^2}} \tag{2}$$

where v means speed of an inertial system.

† Some physicists claim than spacetime of Minkowski exists independently of matter, but my derivation is the same as this of spacetime of Minkowski, thus their claim is only an illusion.

‡ It is possible that the elementary particles are black holes; according to Ockham Razor, this option is very effective.

- ◇ It is possible to ask ourselves, why the Pythagorean theorem exists in Euclidean geometry. It is possible that the cause is the energy law.[14, Pg 2]
- ◇ Derivation of the Hawking radiation of a black hole is long, but the result is short, thermical radiation. Maybe a shorter derivation exist?
- ◇ It is a very effective explanation, why the Stefan-Boltzmann law gives $j \propto T^4$.[15][Pg 2]
- ◇ The uncertainty principle is not the all essence of quantum physics, but wave functions are also important. Brukner succeded to show this on a different way.[16] But, an additional thing can be added to this topic, for instance, sinusoidal nature of a wave function, which is connected with the uncertainty principle.
- ◇ One professor was asked once, how to imagine precession. He answered only that derivation should be known enough. But in true, this can be visualized.[17, Pg 9] Such derivation and the figure is a more fundamental and a more appropriate answer to such question.
- ◇ At all physical derivations, it is important if they can be written to some software code. Let us say that we have a software which can simulate all physics, also quantum gravity. If units had not been reduced, then those units would have behaved non-mathematically and even simulations would be limited. But, physics has a fine property that dimensionless constants can be formed, 1.
- ◇ I do not like that education of physics does not use enough visualizations and does not use enough short derivations, where are possible. Professors too much believe in "Shut up and calculate" instead of in visualization. Probably, quantum physics should also have some visualization and some more clear interpretation.§ There are some good examples of visualization of physics.[18, 19, 20]‖

The above diamond points are thought such that they do not need new measurements, but different derivations clarify new aspects of the same mathematics and physics.

It is very probable that three space dimensions are consequence of quantum physics. This hypothesis was written by Weizsaecker.[21] He thought that this is connected with three spin matrixes. This seems a good supposition for explanation of three space dimensions, but it is mentioned rarely. Beside this, I think that three-dimensional nature of light (direction, magnetic field, electric field) is also connected with three dimensions of space. This is one of many other proposals for explanation of three-dimensionality of space.

The wish is also that such theory of quantum gravity is as simple as possible. One example is dimensionless physics, 1. Theory of quantum gravity should be written on a T-shirt.

§ But it is probably, that quantum mechanics fails for better interpretation, because quantum gravity theory will define more clearly, what spacetime and matter are.

‖ One lapse in Baez paper was corrected by me.

The question of *Big Bang* is also a fundamental question. It is possible that a mechanism behind it is responsible also for the elementary particles.

It turns out by SR that the essence of time are the elementary particles. The purpose of a quantum gravity theory is also that it explains what the spacetime and matter are. Therefore SR and quantum gravity have the common focus. It is also evident that such fundamentality of the elementary particles means that the common expected quantization of spacetime is not good, because spacetime does not exist independently of matter, but all is connected with the elementary particles.

More it will be known, when the principle how the elementary particle is built will be known. One possible principle is also that circulating photons build it. And their circulation is caused by curved spacetime, and so the elementary particle is a part of quantum gravity (in my opinion). Thus the elementary particle is related to a black hole.¶

Because of all this, I do not need minimal possible length, the *Planck length*, therefore some models are excluded.[22, 23, 24, 25, 26] In essence, the *Planck length* still ever exists, but only as an average. But those models, [22, 23, 24, 25, 26], change the principle of relativity, therefore I do not like them and I wish such models of the *Planck length* that do not change the principle of relativity.

Max Planck already speculated that spacetime is grained. There are many options how it is grained, but more and more it is evident that spacetime is not continuous.

3. Matter, information, and consciousness

We can ask ourselves, what is more fundamental, matter or information. Physicists would agree that information is more fundamental than matter,[+] although it seems that the elementary particles are the most fundamental. But, although knowledge of only Newtonian physics suggests that the matter is the essence of all what exists, the new theories arisen after Newtonian physics as thermodynamics, SR, GR, and quantum physics were changed this essence to the information.

The next question is what is more fundamental, matter or consciousness. I claim that consciousness is more fundamental than matter.[27] I claim also that consciousness is a quantum phenomenon. Although this can change quantum physics,[*] but it is not in contradiction with measurements until now in quantum physics. I suppose that changing of the principle of quantum randomness exists.

Quantum consciousness is important, because it is necessary to explain a bit, what is this mechanism in the human body, when *free-will* decides that it will move a hand and then a hand is moved. Consciousness is also a part of physics, therefore it should be explained physically.[27, 28] *Free-will* is something what changes physics and, at the same time, it is similar to quantum randomness. This phenomenon should be measured

¶ The mechanism of the Higgs boson does not yet absolutely agree with this.

[+] Even Sean Carroll claims this, he advocates physics as virtual reality.

[*] *Free-will* decision and absolutely random events are not the same.

in some way.♯

The measurement of Radin[29] is a little similar to testing of this principle. Although his measurement was criticized by de Bianchi[30], this is not essentially for correctness/incorrectness of his results. It would be well that these measurements will be repeated. I wish that the new measurements will be done more carefully, and as a consequence it can be expected that results will be still better, of course, if Radin made them honestly.

Classification and foundation of qualia are also important, for instance, what is common to various basic colors, or what color will we see if our specter of elementary colors would be 16, as Mantis Shrimp has it.

At this, the difference between qualia and *free-will* is important. Qualia are the hard problem, therefore it is hard to desribe them physically, or it is even hard to imagine how to describe them physically. But, a physical model for *free-will* can be imagined, and it can be even tested.

I allow here some changes of my model, because things are not clear absolutely. But, I insist that panpsichism exists, that *free-will* exists, that quantum consciousness exists and that Ockham razor is important at this.

We should also be aware that matter absolutely without consciousness has not sense, and that nowadays matter has no more this meaning that it had been when SR, GR, and quantum physics were not known. Now the essence of matter is only information. Because of this it is also necessary to answer what is connection between matter and consciousness.{Also known as mind-body problem.

But this my belief about larger fundamentality of consciousness than matter does not mean that consciousness is somewhere outside of matter and spacetime. But I claim that the essence of physical world is time and its manifestation as the elementary particle, but this time is also a property of consciousness, or said differently, consciousness is still a more fundamental property of matter, therefore panpsichism is also included.

4. Conclusion

Otherwise, some important experiments are running, like LIGO/VIRGO, KATRIN, DAMPE, Muon g-2, IceCube, some double beta decays measurements†, etc. Maybe in the period of three years it will be known more about fundamental physics than today. I wish that the value of the gravitational constant will be measured with an atomic interferometer and that it will be measured more precisely than today.

Although many of these experiments will be only confirmations of the old theories, enlarged number of physicists will be focused on the right theories, thus brain power

♯ There are some physicists who do not believe in *free-will*, one is Sabine Hossenfelder. Thus, they think that the *Libet experiment* shows that *free-will* does not exist; but other explanations are also possible.

† According to my models, I hope for negative results of the double beta decays measurements.

in the right theories will be larger. Otherwise, measurements of G are more than only confirmations, they will help at new theories. It is possible to add to this that some better presentation of old theories will also focus more people to the right theories, for instance [18, 19, 20].

I wish also an experiment which would determine *free-will* in a human body, and its consequences. Neurologists could and should also tell more about qualia.

Improving of communication in science will be also the next progress in fundamental physics.

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