

# From uncomputability to quantum consciousness to quantum gravity to neutrinos masses measurement

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## Abstract

As first in this essay, I connected "uncomputability and unpredictability" with quantum consciousness, or more precisely, with a quantum decision. This means that I summarized my old model for quantum consciousness. Then, because consciousness is connected with information and because of panpsychism, I assumed that all physics is information. The essence of all physics is also space, time, and matter. The theory that will explain all this mathematically and will find connections between them is quantum gravity (QG). Because physics should also be information, this theory should be informational and also simple. I represent a scheme of a model for QG. Beside of informational aspect it is important that QG will explain one day, what matter, space, time, and relations between them are. These are mysteries, maybe even larger than consciousness, but probably it is connected with them. Probably, within five years the measurement of the masses of the neutrinos will be done, with it I will check my model for QG. This is also one of the rare measurements that will check some theory of QG.

## I. INTRODUCTION

<sup>21</sup>According to the topic of FQXi contest<sup>22</sup> "Undecidability, Uncomputability, Unpredictability" I will try to answer this with my models of consciousness<sup>2,3</sup> and quantum gravity (QG)<sup>4</sup>, which I developed in years ago.<sup>23</sup> But some minor improvements are added here. Among others, in five years we can expect measurements of the neutrinos masses, they will test my neutrino mass prediction, obtained as a side effect of my model.<sup>24</sup>

## II. QUANTUM CONSCIOUSNESS AND PANPSYCHISM

Quantum physics already contains "Uncomputability and Unpredictability", this is called also "quantum randomness". Let us see, how it is with a possibility of quantum consciousness (QC), more precisely that a quantum collapse means a decision. Such a quantum decision cannot be directly explained by quantum randomness, because our decisions are not random. But, I wrote about a model for quantum consciousness,<sup>2,3</sup> where I presented how quantum randomness can become compatible with a decision, as a process in quantum consciousness.<sup>25</sup> In short, I wrote that we have some structure of primitive panpsychism<sup>26</sup> which was treated a lot in entire Ref.<sup>2</sup>. If these units are unconnected, we have the common quantum physics and therefore the common classical physics. But, if these units are connected, we obtain consciousness as we know it and quantum physics as we do not know it yet.

For testing this theory we should measure a physical foundation of consciousness. In Ref.<sup>2</sup> (pg.16) I gave also a proposal, how to measure quantum decision physically with a finger movement, but this is a challenging experiment, it is more a thought experiment.<sup>27</sup> Otherwise, correlates of consciousness are already measured, for instance by Christof Koch. Progress in this area is all the time.<sup>28</sup> The progress is also on supporting areas, for instance Ref.<sup>9</sup>. But, if I exaggerate, a problem is if one measures that the beating of the heart is in correlation with consciousness. But, the essence of consciousness is not in the beating of the heart. Similarly, correlates of consciousness appear where the working memory appears, but this is not something new and is not contradictory to my model of consciousness.<sup>2</sup>

I have another proposal about how to come closer to the explanation of consciousness: Neurologists should measure precisely what neural correlates of qualia of colors in humans are. Then these neural correlates should be compared with the neural correlates of the birds,

the insects, and especially of the mantis shrimp. Namely, the former see in ultraviolet, where the mantis shrimp is especial at large. I suspect also that qualia are some fundamental elements of consciousness and this can be tested by these measurements.

I like simplification and unification of the elements of physics, but unfortunately up to the present it seems that this is not so at consciousness. Namely, it seems that the three qualia of the three basic colors are so fundamental that it is difficult to imagine that they are a consequence of only one quale of some basic color. In contrast, I do not have problems with the imagination of space as a construct of our brains. A feeling of space is also constructed in virtual reality. But I do not imagine such construction of colors, not even that a virtual reality exists which constructs three basic colors. Therefore this is an open problem and I do not claim that everything fundamental about consciousness is clear for me.

I hope that measurements of foundations of consciousness will become such that they will be less ambiguous, for instance, that consciousness or qualia will be more clearly located.

### III. A MODEL FOR QUANTUM GRAVITY

Because I claim that consciousness is more fundamental than matter, it follows from this that the physical world can only be explained as information. Because of this, the foundations of the physical world should be simple, otherwise the physical world is not only information (subjective), but it is also objective, this means that it is independent of our subjectivity and of our information. The essence of all physics is also space, time, and matter. The theory which will explain all this mathematically and will find connections between them<sup>29</sup> is QG.

Therefore, I created an enough simple model for QG. Because of this, I try to answer what is matter, what is its connection with space, time, information and consciousness. (Strangely, but matter is not less mysterious than consciousness, we sense consciousness directly, but matter is sensed less directly.) Including space, time, and matter, time is the most connected with consciousness, because the feeling of time is dependent on consciousness (a cold lizard vs. a warm lizard. . .).

Let us imagine a thought experiment where we try to measure gravitational constant ( $G$ ) as accurately as possible, and in as short intervals as possible. This means that we should observe dynamics of as small black hole (BH) as possible, because in this case accelerations

at an event horizon are largest possible. An extremely small BH has the size of the Planck mass according to the nowadays comprehension of QG.

But at such a size, the measurement of the Hawking photons is more efficient than a direct measurement of acceleration at an event horizon. The calculation shows for these photons that they are thermal. Therefore, if it is assumed that Hawking radiation exists,<sup>30</sup> and that this means the most precise measurement of  $G$ , then we can imply that  $G$  of a BH is changing thermally with time.<sup>31</sup>

Here we can also try with a derivation which tells us how it is with a measurement of acceleration at an event horizon of a BH excluding Hawking radiation. Let us say that such derivation would show  $G$  as constant with time. But, because such a model does not yet exist, such assurance also does not yet exist.

Similarly as we obtained a variable  $G$  with the help of the Hawking radiation, we can also obtain it with the Unruh radiation. We can conclude similarly as at the measurement of  $G$  of BH, this means that the energy of the radiated photons is defined by acceleration, and this is analogically as what we found for the thermal nature of  $G$ .

But we can also look from another aspect – this is how to achieve a constant acceleration. Let us imagine a rocket on photonic propulsion with which we try to achieve a uniform acceleration. But when finitely small photons fly out, acceleration is not uniform, but the velocity is increased in discrete steps.<sup>32</sup> Therefore, to reduce this problem, let us choose differentially small photons. But here we do not have enough information to define energy for every photon. Therefore we should choose the least demanding situation that entropy is maximal and that these photons are thermal. Thus, the energy of the photons is not constant, but thermal, and every differential change of velocity is thermal. (At this we should be aware that time of origination of photon is also random.) But, it is a problem that it is not yet evident completely how a thermal distribution of energy of photons gives a thermal distribution of accelerations.

But, a loose result of this logic is that a totally uniform acceleration cannot be achieved. By the principle of equivalence this means that totally uniform gravitational acceleration cannot be achieved also.<sup>33</sup>

Now with this model we can suspect and argue that BHs can exist in arbitrary small sizes because some nonlinear superposition of mass zero in the Planck mass can give arbitrary small mass. Therefore we can speculate that the elementary particles are BHs. Additionally,

physics is so simplified.

#### IV. GRAVITATIONAL PRINCIPLE OF UNCERTAINTY

At first let us see maybe the simplest and the most general principle of uncertainty, I will call it the Gisin principle of uncertainty.<sup>10</sup> It says that any physical quantity that can be described with a finite volume contains a finite information. When we describe physics with numbers this means either that some number is described with a finite number of decimal places or that it is described with an infinite number of decimal places but with a finite number of lines in a software that calculates this number, for instance  $\pi$ .

The Heisenberg principle of uncertainty adds here that the product of uncertainties of location and momentum is always greater than or equal to  $\hbar/2$ . Let us make this principle still more clear.

Quantization of angular momentum is the simplest use of the Gisin principle of uncertainty in quantum mechanics (QM). In essence, it is described with natural numbers, therefore with finite information. Brukner simplified QM with measurements with spins.<sup>11</sup> As physicists claim, the Heisenberg principle of uncertainty cannot be shown so simply because it is not discrete. I will try to show it more clearly on the next way: If a circulation is projected only to one direction in a plane of the circulation, a harmonic oscillator is obtained. At this, the quantum harmonic oscillator has the smallest value of the Heisenberg uncertainty of all physical examples, this is  $\sigma_{p_x}\sigma_x = \hbar/2$ .<sup>34</sup> Thus, the calculation of the uncertainty principle of a harmonic oscillator is the essence of calculation of the uncertainty principle. Besides, the two approaches to QM have the essence in rotation, both the spin and the harmonic oscillator approaches. Therefore this suggestion is hopeful that it will help toward more clear derivation of the Heisenberg uncertainty principle.

One approach to QM is also of the Brukner,<sup>11</sup> who analyzes QM via the spin. He avoids using a wave function. Because of his analysis, I suspect that the essence of QM is in the Heisenberg uncertainty principle, not in a wave function. The uncertainty principle is a consequence of information and information is the essence of physics. But according to Brukner's paper<sup>11</sup> I suspect that a wave function is only a consequence of symmetry of the space, or of circulation in space. In short, I think that some new aspects of the known mathematics of QM will give an explanation about what is the essence of QM.

This essence of QM and of the uncertainty principle is important to be known because in future we will maybe understand how to generalize it to QG. Now, I wish to do this: another aspect of the Heisenberg principle of quantum harmonic oscillator is important, i.e. this is Gaussian distributions for location and momentum which we obtain during the derivation. If a standard deviation of one curve is enlarged, the deviation of the second curve is reduced and vice versa. At this it is important that the Gaussian distribution is the distribution with the maximal entropy, and that it is symmetric according to the  $x$  axis. Therefore, locations and momentums are so positive as negative if the right appropriate zero points are selected for both.

As the distribution of the mass of the BH we obtained the thermal distribution. Its similarity with the Gaussian distribution is that its entropy is also maximal, but the distinction is that this distribution is only a positive function, in principle. This is logical because mass (or rest energy) is only positive.

The simplest derivation for the Unruh radiation (therefore also for the Hawking radiation) is Ref.<sup>12</sup>. At this a question appears what is the essence in derivation that thermal distribution appears. Namely, thermal distribution is something very fundamental, but this derivation is still ever too complicated because it also uses the  $\Gamma$  function. Therefore, it is necessary to find something more simple, and I suppose that it exists.

A similar question is also for the Gaussian distributions at the quantum harmonic oscillator. A wave function and the Fourier transformation are used at this equation, but I hope that Gaussian distributions can be explained without both of them.

The essence of special relativity is in rest matter. Namely, time runs only in (potentially) rest matter, therefore in the elementary particles and in BHs. Therefore the study of BHs is also the essence of QG, in my opinion. Thus, I also claim that totally empty spacetime without rest matter does not exist. Many physicists claim differently,<sup>35</sup> but they do not respect that GR is not dimensionless, but only quantum physics creates QG from it, and thus QG is dimensionless. And this dimensionless physics is also one essence of physics. If dimensionless physics had not existed, physics would have been less explained.

With such a model for the variation of BH masses (and the elementary particles are also BHs) the objective matter becomes much less stable and fixed, and becomes more informational and subjective.

But it is almost the fact that spacetime is not predefined at a derivation of QG,<sup>14</sup> but

at calculations of QM the spacetime is predefined. Besides, as I believe that real gravitons exist, but it is a question whether a virtual graviton exists, respectively, whether virtual gravitons can be incorporated in Feynman graphs. According to the above comprehension, it is not sure that they can be incorporated in.

At my model we should respect that the variable mass of a BH causes a variable gravitational field and this uncertainty of gravitational field is what causes quantization of gravitation.

These were my hints, which are necessary (in my opinion) that we will reach the gravitational uncertainty principle and QG.

Whatever a correct gravitational principle of uncertainty is, my incomplete suggestion with a thermal distribution seems more simple and more in line by Ockham razor than some other ad hoc suggestions for it.

## V. THREE DIMENSIONAL SPACE

At questions of QG, the three-dimensionality of space is also important. Brukner cites Weizsäcker where it is speculated that this is a consequence of Pauli matrices.<sup>15</sup> I think that this is correctly, only a solid derivation is missing. I have a suggestion that the three-dimensional nature of an electromagnetic wave is also a cause for the three-dimensional space. Because I also believe that Pauli matrices are a cause for the three-dimensional space, I think that these two causes are connected.

It is my suggestion, of Isham,<sup>14</sup> and of many others that spacetime is created by QG, i.e. QG is not put in a predefined spacetime as QM is. Namely, an absolutely empty spacetime cannot exist if quantum physics is included. Here it is also possible to include causes for the three-dimensional space, for instance, a quantum BH is assumed as a three-dimensional one.

## VI. A TEST OF MY PHYSICAL MODEL

Beside of my proposals for tests of my model of consciousness, I found also possibilities for testing of my model for QG.

In truth, the described model for QG arose after I obtained formulae for the elementary

particle masses.<sup>4</sup> Although some formulae are against some facts, i.e. with the quarks and the Higgs boson, we can discuss and test the rest of the formulae.

My model predicted the masses of the neutrinos,<sup>7</sup> gravitational constant,<sup>4</sup> (Eq.(50)), an explanation why the cosmological constant is much smaller than predicted,<sup>4</sup> (Eq.(61)), etc. The most reliable is my prediction of the masses of the neutrinos,<sup>7</sup> the most probably it will be measured in five years. The project DESI<sup>36</sup> is the closest to realize this.<sup>37</sup>

Therefore, the experiments for which I wait for results are DESI, Euclid, and LSST if I begin with the most essential ones. These will measure the masses of the neutrinos on a cosmological basis. Thus, they will test my prediction.<sup>7</sup> After a lot of years, projects Project 8, ECHO, and Holmes will measure the masses of the neutrinos. Project KATRIN will only reduce the lower limit (the word "only" is valid if my prediction and cosmological predictions are correct). Projects LEGEND, CUPID, and nEXO will measure with double  $\beta$  decay, and so they will conditionally measure more precise masses of the neutrinos if the background physics enables this. Experiments such as JUNO, DUNE, and Hyper-Kamiokande will probe the neutrino-mass ordering implemented in nature.<sup>17,18</sup>

MEGANTE will use atomic interferometry and so it will tell better what is the value of  $G$ ; the first time the essentially different principle of measurement of  $G$  will be used to check the measurements which were made until now.

E989 will check whether the magnetic moment of the muon is essentially different as calculated. Maybe this will help at my model, although I do not yet know how. Maybe new physics will happen at new measurements of X17 particle;<sup>19</sup> admittedly such measurement are often wrong.<sup>38</sup>

## VII. BIAS IN SCIENCE

What the progress in science is and when we will achieve explanations for QG and consciousness is determined also by a human factor and by bias in science. Thus, bias means uncomputability, therefore science does not track only the logic, but also tracks the noise of the human bias and of the human factor. This means that some correct papers are not accepted for publication, some good experiments are not allowed or paid, etc.

My experiences are that bias and the human factor in science are significant.

- The first example is that I found a mistake in one old paper. A referee said that my

correction is correct, but he will need too much time for style improvements, therefore he rejected the paper.

- The second example is that arXiv gives unreal conditions for publications of people who are not from universities.
- The third example is that one journal wants that a paper is published in arXiv. But only people from the universities can send to arXiv.

Etc.

Some people even study this bias scientifically,<sup>20</sup> but analyzes of complaints because of the rejections of papers of amateurs are not so published. The word "amateurs" means that they are not from universities, and all spectra bellow this condition. It should be analyzed what the chances for publications of amateurs are. The opportunities for publications of amateurs should be defined and enabled, and system should be built up and should be fair, but they are not. I hope that artificial intelligence (AI) will be made which will find and filtered useful information about scientific papers, i.e. about quality of the paper, about precise area of the science, i.e. from scientific journals as well from papers of amateurs. Thus, such AI would work on a higher level than only with keywords.

Of course, this does not mean that all or the main part of amateurs papers should be published.

But this analysis needs a new paper.

## VIII. CONCLUSION

Connections among "uncomputability and unpredictability", consciousness, and QG are shown in this essay. The further development of the model will show maybe if the model is correct. This will also be shown by the measurements of the masses of the neutrinos,<sup>7</sup> which will happen in some five years. Namely, a side product of my model for QG is also the formula for the mass of one of the neutrinos.

This FQXi contest is also an opportunity that many people will see this prediction before it will be tested. Namely, after the prediction will be already tested, the beginning of

promotion will be less effective, although it is already predicted in viXra, Ref.<sup>7</sup>.

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- <sup>21</sup> This paper will be presented in FQXi’s essay contest “Undecidability, Uncomputability, and Unpredictability”, the interval of this contest is inside 2019-2020.
- <sup>22</sup> I found even a TV series,<sup>1</sup> which has similar topics as the FQXi contests.
- <sup>23</sup> Other papers with variations on these topics are located in viXra,<sup>5</sup> FQXi,<sup>6</sup> and in other places.
- <sup>24</sup> If we say more precisely, only differences of their square of masses are known today, but in five years their values will be known, as physicists expect. I predicted only one mass which maybe will agree with one of the masses of the fundamental neutrinos, used in the calculation.<sup>7</sup>
- <sup>25</sup> *Thus, I suppose that a lot of primitive consciousnesses exist whose influence on the collapse of wave function exists, but they are mainly unconnected, therefore they do not give any sign in known measurements that disagreements of rules of quantum mechanics (QM) exist. Let us call the above new type of wave function collapse the causal one, because an observer decides*

*according to the earlier information which result of the collapse s/he wants. This differs from the common collapse of wave function, which is non-causal. A common explanation for both mechanisms is that the mechanism of functioning of consciousness is such that it influences on a wave function collapse, but if any previous information does not exist here, these collapses are random, and thus wave function collapse is non-causal for an external observer.*<sup>2</sup> (pg.16).

<sup>26</sup> It is interesting that many defenders of panpsychism call themselves also as materialists.<sup>8</sup> Two examples are Christof Koch and Giulio Tononi. But I think that I am not a materialist.

<sup>27</sup> Now I found an additional simplification of this measurement: Instead that a testee purposely moves a finger, a measurement with fMRI should allow her that her thoughts press some button. (The condition is that she press the button with her thoughts purposely, not that her thoughts cause unintentional presses of the button.) This experiment reduces study of free-will decision to a smaller region of the brain. It is even possible that only further definition of this experiment can give some information about free-will decision, so that it is useful also as a thought experiment.

<sup>28</sup> I gave some references in the old papers, and using some keywords it is possible to find new references.

<sup>29</sup> In Ref.<sup>2</sup> (pg.18) I write how space is additionally relative if consciousness is included. (Approximately one year ago I read, that Daniel Dennett and some others wrote similarly.)

<sup>30</sup> It is a possible objection that Hawking radiation is not proved, one person really gave me such an anti-argument against my model. But, this is a starting approximation for QG, and the further derivation can be built up in this approximation. Similarly as the Hawking radiation is a legal derivation, this derivation is also a legal one.

<sup>31</sup> More precisely,<sup>4</sup> the value  $\mu$  is changing thermally but this maybe also means thermal changing of masses of BHs or of the masses of the elementary particles. But such details will not be considered here, but it is described in Ref.<sup>4</sup> (Eq.28, etc).  $\mu_i^2 = m_i^2 G / (\hbar c)$ , where  $m_i$  are the masses of the elementary particles,  $\hbar$  is reduced Planck constant,  $c$  is the speed of light, and  $\mu_i$  are the dimensionless masses of the elementary particles.

<sup>32</sup> How velocity curve is created should be given by Ehrenfest equation.

<sup>33</sup> Although some physicists do not believe that the principle of equivalence is valid everywhere, especially at a huge gravitational field, typical for QG regime, my model with a rocket with photons propulsion is valid everywhere, also at weak gravitational fields.

<sup>34</sup>  $p_x$  is momentum in  $x$  direction, and  $\sigma$  is uncertainty of  $p_x$  or  $x$ .

- <sup>35</sup> Motl: *General relativity implies that the only "information" that the vacuum carries at each point is the so-called "metric tensor" - a set of numbers that allow one to calculate the distance between any two nearby points. This is enough for the vacuum to be able to bend - much like any material. One doesn't need any atomic constituents to be able to talk about the geometry of the space, and to guarantee that the environment is able to get curved (and to distinguish a flat region of the vacuum from a curved one).*<sup>13</sup>.
- <sup>36</sup> By the way, DESI will measure a lot of galaxies, everyone at one point. But I do not understand why they will not measure every galaxy at two points, because this gives additional information about the precision of measurements?
- <sup>37</sup> After my first prediction, the upper limits were reduced by a factor 1/3 to 1/20.<sup>7</sup> This is some achievement. Although it seems that a new theory<sup>16</sup> will enlarge this factor, we will see what will happen.
- <sup>38</sup> If you put every acronym and keywords in this section into Google, you will obtain links to these projects.