

# The informational physical model and fundamental problems in physics

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**Abstract.** This article is some review of results that were obtained at 2007-2021 years development of “The Information as Absolute” concept and the informational physical model, which is based on the concept; including a number of fundamental physical problems are briefly considered in framework of the conception and the model. Recently in physics there are several publications, that present lists of the problems. However, those lists are essentially incomplete, for at least two reasons. First of all, a number of phenomena are studied traditionally by philosophy, and so corresponding problems are usually considered to be “metaphysical”. However, they relate also to some concrete physical phenomena. For example, physics evidently studies Matter, and so the metaphysical problems “what is ontology of Matter”, “what is “Space”, “Time” and a few other physical phenomena and notions as well, are really a Meta-physical problem “what does physics study?” There are other fundamental physical problems, which are not considered as such in physics, and are absent in the “fundamental problems lists”. Those include the problems, which really exist, yet are incorporated into standard physical theories, and so are fundamental “implicitly”, which in physics are “solved by default”. Note, though, that a number of “Meta-physical”, and concrete fundamental, problems more in detail are considered in the paper “The Informational Conception and Basic Physics”, <https://arxiv.org/abs/0707.4657>, v5 (2021), so this paper is, in certain sense, an expanded conclusion of this paper, which includes, correspondingly, more in detail consideration of some more general physical problems. Besides, the concrete problem “What is Life”, and the rational cosmological model, where a few vague points in standard cosmology rather probably are rationally clarified, while the fundamental problem “matter – antimatter asymmetry” in Matter is solved practically for sure, are considered, and one of recently published rather complete “lists of fundamental problems” is commented in Appendix.

**Key words:** Matter, Consciousness, informational physics, fundamental physical problems, cosmology, quantum mechanics, relativity theories, Standard Model, particles, antiparticles, fundamental Nature forces, EM force, magnetic monopole, Gravity, quantum gravity, fast bodies mechanics, Lorentz transformations, spacetime, experimental testing.

PACS numbers: 01.70.+w, 03.30.+p, 04.80.Cc 14.80.Hv, 12.20.-m, 11.15.Kc, 11.80.Fv 03.50; 12.60.-i; 12.90.+b; 14.60.Cd; 03.70.

## I. Introduction

In this article a number of fundamental physical problems are briefly considered in framework of the “The Information as Absolute” concept and the informational physical model, which is based on the concept, that were developed in 2007-2020 [1]-[15] .

By now, there exist a number of publications, where the authors formulate some lists of fundamental physical problems, for example, [16], [17], the corresponding Wikipedia article, etc., analogously to Hilbert’s presentation of twenty-three problems in mathematics at the International Congress of Mathematicians in Paris in 1900 [16]. The published lists of problems are mostly similar. Correspondingly in this paper we consider some of problems in one of rather complete list in [17], which partially are considered in the main text, and briefly commented in Appendix

However, the problems’ lists in such publications are essentially incomplete, by two reasons. First of all there are a number of physical phenomena that are studied traditionally by philosophy, and so usually are considered “metaphysical”. They relate, nonetheless, to physical phenomena as well — for example physics evidently studies Matter, and so the metaphysical problem “what is ontology of Matter” is really a Metaphysical problem “what does physics study” as well.

The metaphysical problem “what is ontology of Consciousness” also relates to physics directly, starting from the physical problem “why and how physical measurements and interpretations of the measurements are sometimes adequate to the objective reality?” Besides, this problem was actual on first stages of development of the quantum mechanics, and is rather actual now; and not only – really a number of, including outstanding, physicists attempted to solve the really “consciousness problem” in framework of physics, though this problem as a rule is formulated as “what is Life?”, including when it is considered in [17].

Such metaphysical problems as what are the fundamental phenomena/notions “Space” and “Time”, and a number of others, are really the fundamental physical – “Metaphysical” – problems as well, but are not considered as such in physics, and so are absent in the “fundamental problems lists”, as that are also the problems incorporated into standard physical theories, and so formally are solved. For example, in [17] the problem “Why are the particles of ordinary matter copied twice at higher energy” is pointed. However, the problem “what are particles at all” evidently precedes that, and seems as evident that only after solving that last problem it would be possible to obtain the rational answer for the first problem, etc. However, the list in [17] does not contain the latter problem, which – and a number of others - in physics are “solved by default”, despite that really exist.

A number of concrete fundamental, problems in detail are considered in the arXiv paper “The Informational Conception and Basic Physics”, v5, 2021-year version [5a], so in this paper, which is to certain extent an expanding conclusion of whole informational model, mostly a few selected generic physical problems are considered in detail. Besides, here are considered the problem “What is Life”, and the rational cosmological model, where a few vague points in standard cosmology rather probably are rationally clarified, and the fundamental problem “matter – antimatter asymmetry” in Matter is practically for sure solved.

Finally note, that this consideration, which includes solutions, and/or at least essential clarifications, of more than 30 fundamental physical problems in the model, is based, first of all, on the rigorous proof in the “The Information as Absolute” concept [1] – [3] that nothing else exists besides some informational patterns/systems of the patterns that are elements of the absolutely<sup>1</sup> fundamental and absolutely infinite “Information” Set. Which (the Set) exists absolutely objectively really, because it fundamentally, logically, cannot be non-existent, and so is absolutely eternal, having no Beginning and no End, including “Matter” and “Consciousness” absolutely for sure are some informational systems – elements of the Set.

## II. Meta-problems

### A. “What is “Information””

Really the phenomenon/notion “Information” in philosophy and sciences remains to be principally transcendent – neither philosophy nor any science define “Information” substantively enough, all what exists is/are definitions of only specific traits/properties of Information (more see [3]), starting from the evident from everyday practice trait that “information” is

“(Philosophical encyclopedia) “Information (lat. “informatio” – an examination, a notion, a concept): 1) a report, a notification about a state of affairs or about something else that is transmitted by a person; 2) decreased, removed uncertainty as a result of the communication obtained; 3) a notation inherently relating to a control; signals and their syntactic, semantic and pragmatic parameters; 4) transmission, reflection of the variety of any objects and processes (of alive and non-alive nature)”;

- i.e. briefly “information is some data”. That is evident tautology, however this tautology is inevitable in mainstream philosophy and science, since really the Information is absolutely fundamental and common phenomenon/notion, and so principally cannot be defined through some more common notions.

The correct scientific elaboration of the problem “what is “Information”” was made in the “The Information as Absolute” concept, [3]

The phenomenon “Information” and the “Information” Set have a number of fundamental properties, which are considered in [3], so more see the referenced paper, here note only that Information is extremely bifurcational and paradoxical phenomenon, which principally cannot be formalized in any theory, and so, for example, existent in sciences a few “theories of information”, i.e. “Shannon informational theory”, a few theories in cybernetics, describe only some essentially limited informational structures.

In the concept the utmost common definition of the absolutely fundamental phenomenon, “Information” is:

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<sup>1</sup> Here and further “absolutely fundamental” relates to phenomena/notions that exist and are valid on whole “Information” Set, when (“simply”) “fundamental” relates to phenomena/notions that are fundamental in Matter and “consciousness on Earth”, including human consciousness; and in the mainstream philosophy, natural and social sciences.

**“Information is something that is constructed in accordance with the set/system of absolutely fundamental Rules, Possibilities, Quantities, etc. — the set/system “Logos” in the concept”.**

Or, by other words, the “Logos” set elements “make something to be information”.

A few examples of the “Logos” elements are considered below.

## **B. Some elements of the “Logos” set as fundamental physical problems**

Most of the “Logos” set elements are transcendent in the mainstream, when some of them are Meta-physical phenomena/notions, so scientific definitions of which are corresponding fundamental physical problems. In this section the problems are

### ***1. “What is Quantity “Energy”***

- Energy is the “Logos” set element [3], [5], which is absolutely fundamentally necessary for to change, including, of course, to create, of any/every informational pattern/system. That is because of the fundamental logical self-inconsistence of the other absolutely fundamental [also an element of the “Logos” set] phenomenon/notion “Change”:

- at every change of something its state is simultaneously former, recent, and future states, when all the states are different by definition. That is logical nonsense.

To overcome this logical prohibition of changes at every change it is necessary to pay by two points:

(i) – to change [including to create] some informational pattern/system it is necessary to spend some non-zero portion of “Energy”. However, that is not enough if the portion is finite; and so, besides,

(ii) – really at any change the changing state on some level/scale is uncertain – “illogical”.

From the above follows the answer on the next fundamental problem

### ***2. “Why in Matter quantum effects exist at all”***

Note, though, that the fact of impossibility of deterministic continuous changes of anything was proven more 2500 years ago by Zeno in his brilliant aporias, when Zeno, in fact, predicted the quantum mechanics.

Relating to QM note also here, that from the concept directly follows the answer on next (“implicit”) fundamental physical problem:

### ***3. “Why does the QM postulate exist that all given type particles are identical, and why is it adequate to the reality”***

- this QM postulate is adequate to the reality because all given type particles are copies of the corresponding unique informational patterns, that is a typical situation in Information.

That above in this section is essentially the answer on the fundamental problem:

#### 4. *“What is physical parameter “Energy””*

- however that clear physically answer remains to be incomplete “metaphysically”, Energy remains to be a mysterious element of “Logos” set. Unlike other “Logos” elements, which rather clearly relate to the main trait of Information “is a data”, when the necessity of Energy in concrete informational system “Matter” is clear – see above, however it remains, including in Matter case, now completely mysterious - so from where and how some energy appears to create or to change something? Nonetheless, besides the above (for which Energy is necessary), now it is also understandable that Energy is rather “dull” Quantity, and the changes in informational patterns/systems are eventually determined by concrete information of concrete changing/creating patterns/systems.

However, that till now is not too essential in physics. The reason is that Matter is rather simple logical system, which is based on a limited set of fundamental and universal basic logical rules/laws, links, and constants (more see below), where the exchange by energy at material objects interactions is, in depth, highly standardized and universal, and the dependence of the action of Energy on difference of informational content in different material objects so is inessential, besides that there are, correspondingly, a few “forms of energy” – “kinetic”, “thermal”, “nuclear”, etc.,

- and, if we don’t address to the question “from where and how energy in Matter appeared at Matter’s appearance”, this problem isn’t actual because of the energy conservation law, at Matter’s constant evolution only redistribution of the primary energy portion proceeds.

Besides note here, that actualizations of Energy action are as a rule concretized as that relate to concrete changes of states of some informational patterns/systems in accordance with what concrete degree of freedom of the changes is actualized. In this case other absolutely fundamental “Logos” Quantity acts – “Momentum”, which is directed in informational patterns/systems’ “spaces” [more about what is “space” see below], however in this case the fundamental uncertainty of Change above reveals itself as “momentum uncertainty”, whereas energy of the patterns/systems in some cases doesn’t change; say, that happens at motion of a charged particle in a stationary magnetic field.

And what looks just as real, there exists a more fundamental and mighty than Energy phenomenon: “Logics”, and Information itself also, correspondingly. Though Energy on first glance seem as something external to Information, for example to some data, nonetheless if it could exist a state, when there is “nothing”, including “no energy”, nonetheless in this case there principally exists — since logically cannot be non-existent, the [“Zero statement” in the concept] endless cyclic dynamical informational pattern “there is nothing, besides the information that there is nothing, besides...”

From the above follows the answer on the next fundamental physical question:

### 5. “What is “Inertia””

Inertia, correspondingly, is absolutely fundamental phenomenon that characterizes the logical resistance to changes because of the self-inconsistence of “Change” above. As energy, the inertia in simple informational system “Matter” can be, and is, characterized; according to Newton, by the physical parameter “inertial mass”. Note here, that that has no relation to the existent in standard physics explanation of what is the inertial mass as some action of the Higgs field.

On an aside, note a tenet, rather popular in official physics, that “energy and mass are two faces of one coin, one of them converts to another”. That is fundamentally incorrect. Both absolutely fundamental phenomena “Energy” and “Inertia” indeed absolutely fundamentally always co-exist in every informational pattern/system, including in every material object, but they are fundamentally different, and so, say, at the interactions in Matter first of all energy transforms/is distributed into energy, though with obligatory accompanying by transformation/distribution of inertial masses.

### 6. “What are “Space” and “Time””

The answer on these questions in the concept [3] is:

“Space” and “Time” are absolutely fundamental Rules/Possibilities [elements of the “Logos” set] that are absolutely fundamentally necessary for any informational pattern/system could exist:

- “Space” is necessary for any information could exist at all, and
- “Time”, additionally to Space, is necessary for some informational pattern/system could be dynamic, i.e. could change.

“Space” as the **Possibility** makes be possible placing in concrete “space” concrete informational patterns/systems, which (the space) at that is realized as a concrete set of “space dimensions”, which (dimensions) are necessary to actualize independent degrees of freedom of the concrete patterns/systems at changing of all their possible states.

Since Space is a logical possibility, the sets of the dimensions form so concrete, and principally infinite, “empty space containers” for the concrete one type patterns/systems. For a space it is all the same – how many one type patterns/systems, which are constructed by the same concrete sets of logical rules/links/constants, and so have the same degrees of freedom at construction and changes, are placed in the container.

And it is all the same – in what places in the infinite container the patterns/systems are placed. The unique requirement, when **Space** acts as the **Rule** is that a non-zero “space interval” must divide the different patterns/systems, and any pattern/system must occupy non-zero “space interval” (a “space volume”, if there are more than one intervals in different dimensions) as well. In that Space is the utmost universal grammar rule – as most of other Logos elements, besides “Energy” and “Momentum”, by some ways are, which just so exists in all human languages.

Since any information absolutely fundamentally cannot be non-existent, everything had happened/existed in the “Information” Set; and everything is happening/existing, and will happen/exist always;

- and the concrete patterns/systems, including Matter and consciousness, simply use the fundamentally always existent concrete spatial dimensions from the at least “simply” infinite “number” of spatial dimensions of the Set’s whole spacetime in concrete actualization of current state of concrete pattern/system. As that is, for example, for Matter and humans in this concrete actualization of Universe evolution.

“**Time**” as the **Possibility** in main traits is analogue to Space, it is “the space for changing states of changing patterns/systems”, and exists/acts in concrete cases forming, including, corresponding “time dimension” for dynamical patterns/systems.

However, Time has the essential difference from Space: for Time it is all the same by what reason/way, by what degree of what freedom, etc., and in what informational pattern/system a change happened.

So in this case it is enough to have only one absolutely fundamental and universal dimension, which exists and acts in whole “Information” Set for all changing states of all dynamic the Set’s elements; in the concept, including first of all in the physical model, the corresponding term is called the “true time” dimension.

**Time** as the **Rule** also acts as that a non-zero “time interval” must be between different states of changing patterns/systems. However, in this case this Rule, unlike Space, seem as is determined by a couple of two, on first glance different, absolutely fundamental and “external to time” causes. The first one is that any information if appeared can not be non-existent, and so the next changing state can not “erase” previous state. The second is that a continuous changing of states is impossible, because of the logical self-inconsistence of the Change above, and the changes happen only along non-zero time intervals.

At any change of any informational pattern/system this pattern/system moves in the time dimension on corresponding time interval  $\Delta t$ , in every case, when the changing pattern/system is fixed in space, and at every change of its spatial position on, say,  $\Delta x$ . At that the changing of a pattern/system spatial position can be in principally arbitrary number of space dimensions, whereas all dynamic elements in the Set move at change only in one, universal “true time” dimension.

Space and Time thus form concrete “empty containers” - “spacetimes”, for concrete dynamical patterns/systems.

Finally, in this section we make a brief remark to existent definition of “Time” in recent physics. This definition was firstly done by Newton [18]

“...Absolute, true and mathematical time, of itself, and from its own nature flows equably without regard to anything external, and by another name is called duration ...”

- at that for Newton, correspondingly, clocks show the time flow independently on time and only because of they also tick equally equably,

- and this definition, however with the two relativistic modifications, remains in physics. According to special relativity postulates time (i) - not only flows equably, this flow depends on motion, and, whereas in stationary inertial reference frame time flows in accordance with Newton's definition, in moving frames its flow becomes be dilated, and (ii) – time governs material bodies, including clocks, and so “time is what clocks read”, and clocks show in stationary frames “Newton's” flow, and in moving frames – dilated flow. Besides this time flow is observed as an “arrow of time” [19].

From the correct definition of “Time” above it follows that there cannot be any, “Newton's”, “normal”, “dilated”, etc., “time flows”, and any “arrows of time” as well – and fundamentally time cannot impact on anything. Matter, and every material object/system, including clocks, simply constantly, because of the energy conservation law, change, and so move in the true time, passing from given states to mostly more probable states; when a changing is deterministic, that only connotes, that the probability is equal to 1; clocks are special material objects that – rather specifically, though (more see [5a]), show how they move in the time dimension.

### C. “What are “Matter” and “Consciousness”

The utmost fundamental in the mainstream science Meta-phenomena/notions “Matter” and “Consciousness” are fundamentally transcendent in mainstream philosophy, and so the philosophy is composed by two fundamentally different doctrines, which have numerous sub-doctrines, schools, etc., “Materialism” and “Idealism”, which really are nothing else than systems of transcendent beliefs:

- materialists truly believe in some transcendent “Matter”, which for some transcendent reasons, and by some transcendent way, exists eternally; and is, as that follows from the observations, again for some for some transcendent reasons, and by some transcendent way, some evidently well logically organized system;

- idealists truly believe in some transcendent “Idea” (“Spirit”, “Consciousness”, etc.) which for some transcendent reasons, and by some transcendent way, exists eternally; though in this doctrine the fact that everything looks as evidently logically organized system follows from that is result of action of “conscious” “Idea”, etc., - though it is evidently in this case necessary to define – what is “conscious”, what is again fundamentally impossible in the both doctrines; and so the transcendence of Idealism really isn't much lesser than of Materialism

In the concept both, “Matter” and “Consciousness”, are utmost commonly scientifically defined — “Matter” and “Consciousness” absolutely for sure are nothing else than some informational systems – the Set's elements, so are made from the same stuff “Information”, and in accordance with the same “Logos” set's elements; whereas “Information” (and yet now most of “Logos” elements as well aren't) isn't transcendent, and it, and so any informational structure as well, can be principally rationally cognizable, (what is “cognizable”? – see below).

Note here also, that from the above it follows that any informational system of elements is always something like “computer+program shell” system, where “hardware” is the elements, and “program shell” is the concrete the system's basic set of laws/links/constants, in accordance with the elements interact composing just this

system, exchanging at that by some informational messages, which use concrete language in the system.

Including “Matter” and “Consciousness” are some systems, which, however, have fundamentally different basic sets of the laws/links/constants, and so are fundamentally different; the main difference is in that Matter is logically closed in the Set system, which so practically doesn’t interact with other the Set’s elements and thus is essentially stable system;

- whereas Consciousness is fundamentally open in the Set system, and, as that is one of the utmost specific properties of just any consciousness in the Set, is that consciousness principally is able to obtain and logically analyze any information in the “Information” Set; at that, however, because of consciousness has fundamentally limited capabilities at obtaining and processing of the principally infinite in this case information, every result of the processing is always at least partially uncertain;

- and, at that, if a consciousness obtains some information, about which she hasn’t some earlier information, the consciousness assigns to this information the label “this information is non-understandable”, and further, if that is necessary, or that is interesting [“Curiosity” is another utmost just specific property/ resident utility in the “shell” of any consciousness], studies the Set’s element, from which this information is obtained – again “no understanding” state is just fundamental specific state of any consciousness.

All that is in principal contrast to what happens in Matter, where every of Matter’s elements, i.e. particles, bodies, fields, cosmological objects, always completely knows all Matter’s laws/links/constants, so at interactions uses/exchanges by only true information, and behaves after obtaining some concrete message again in complete accordance with the basic Matter set above. Or, by another words, since the Matter’s basic set “is written” in every Matter’s element, Matter isn’t some “whole” computer, it is an automaton,

- whereas any Consciousness version is “whole” computer, i.e. her hardware and program shell contain some “BIOS”, “processor”, “random access memory”, and some specific utilities that organize work of the whole consciousness’ s functional modules.

Finally, here note, that, though “Matter” and “Consciousness” are fundamentally different systems, whereas physics really studies only Matter, and so really the “consciousness problem” isn’t a physical problem, nonetheless understanding of “what consciousness is” is necessary for physicists for a number of reasons. First of all, in this case we have answers on the really main epistemological – and practically so important in any science – questions “so what studies of what?”, and “why the first what sometimes adequately, and sometimes illusorily, to the objective reality studies the second what?”

Both these questions principally cannot be answered in framework of the mainstream, since in the mainstream both the whats are fundamentally transcendent, however in the concept the answers are natural: in spite of that consciousness, including the “homo sapiens sapiens” version, and Matter, are fundamentally different, however, since both are made from nothing besides “Information”, and absolutely obligatorily in accordance with the same “Logos” set,

- there is nothing surprising in that one informational system, which is able to obtain from, and logically analyze information about, other informational system, makes that correctly, and sometimes incorrectly – that principally doesn't differ, say, from the case when a human decodes information that was created by other human, say, when some linguists decode hieroglyphs that were written on some non-existent now languages.

Besides historically the “consciousness problem turned out to be an – and rather popular – fundamental physical problem, and so it is pointed practically in all “lists of fundamental physical problems” above, being formulated usually, though, as “what is Life” problem; and, besides, historically the “consciousness problem” appeared in well known physical problem of the role of observer at quantum mechanics measurements; so “consciousness problem” it is considered also in this paper in corresponding “What is “Life” section below.

#### **D. What is “Life”**

As that was pointed above the two known now fundamental informational systems “Matter” and “Consciousness” are fundamentally different. Currently humans know only one Consciousness' version, “the consciousness on Earth”, diverse versions of which every living being on Earth, including humans, have. The main differences – and similarities – between a Matter and any Consciousness in the Set are pointed as well – both systems are made in accordance with the same “Logos” elements, both are some “computer+program” systems, where similar exchange by concretely logically organized information between the systems' elements proceeds;

- however these systems are fundamentally different since are based on fundamentally different sets of the basic laws/links/constants; and so, though in Matter all/every elements, say, every electron, know physics absolutely completely, what any human never will do, however, at that, all/any material objects/structures fundamentally don't know – and fundamentally aren't able to know – anything else, thus everything in Matter fundamentally isn't, and never can be, “conscious”.

Correspondingly every of both, Matter and Consciousness, exists and changes in essentially different spaces; say, if in Matter it is possible to establish some etalon for measurement of bodies' lengths and distances, say, “meter”, but nobody now knows, say – how many meters long a human's thought is in a consciousness space dimension.

Though consciousness on Earth operates also in Matter's space, when she governs, using some unknown forces, practically material living beings' organisms, including systems “body+brain”. Both corresponding spacetimes share the one true time dimension which is fundamentally obligatorily common for all dynamical patterns/systems in whole Set (more about what are Matter's space/time/spacetime see [5a] and below).

Thus, there principally cannot be some “emergence” of any consciousness from any material structure, as that is, as a rule, assumed in many existing now “theories” “models”, “solutions” of the “mind-body problem”, etc., in neuroscience and physics. Really the informational system “the consciousness on Earth” could, in principle, exist in the Set in parallel with possible Matter's Creator even before Beginning of Matter.

However, because the consciousness is a principally open informational system, the “life” of such system is rather cumbersome in the unstable, and possibly destructive, environment of the Set. So seems a few billions of years ago this consciousness version has used an opportunity to make some material house from some stable Matter’s atoms, first of all as a stable residence and source of energy at operating and development. Thus Life rather probably appeared on Earth (though we cannot exclude now that this consciousness version was developed and created by some other Consciousness in the Set, for example by with rather non-zero probability existent Creator of Matter).

After that, “the consciousness on Earth” developed the practically material residence in accordance with seems evidently observed trend “more and more outside Matter into other Set’s regions”, up to the “homo sapiens sapiens” version. That one has well developed ability to obtain and to process information in the highest, “mind mode”, mode of operation, when information is processed abstractly i.e. in some cases without direct relation to what happens in Matter, or somewhere else in the Set.

However, this consciousnesses ability to affect material structures is extremely weak, at least for ordinary human consciousnesses, including most of physicists; and so really there is no some “observer problem” in physics:

- at any experiment a studied, including a quantum mechanical, material object/system/process interacts with human material instruments, mostly as observed “ $\psi$ -function collapses”, only in rigorous consistence with the laws/links/constants that act only in Matter, when on the QM depth everything in Matter, independently on — in humans experiments or not, constantly happens as endless chains of the “ $\psi$ -function collapses”, etc.,

- and all that, again, happens without any dependence on whether an “observer” exists or not at all; including the collapse of Schrödinger cat wave function would happen without any relation – some observer opens or not the box.

More about “the consciousness on Earth” see in the first approximation functional model of the consciousness [14, 15].

Finally note here the common for the last two section problem: though it is rigorously true that any consciousness fundamentally cannot “emerge” from any material structure, since any/every material structure is some rigorously closed logical system, whereas, say, material structures can be – and are – constructed and created by a consciousness; and it looks as very probable that Matter was for some reasons designed and created by some extremely mighty Consciousness in the Set [more see section “Cosmology” below], however that by no means clarifies the problem – so why/how some consciousness can emerge in the Set?

In this case it looks as rational to suggest that that can happen if in the Set some informational systems accidentally appear after some rather arbitrary, strong enough energetic impacts in some “informational chaos systems”, which aren’t logically rigorously closed, but in which some primitive versions/logical constructions of the consciousness’s fundamental utilities “Providing self-stability”, and “Seeking self-development” are formed,

- than at least in some cases some of such systems could exist for a long time enough, enforcing their abilities at providing self-stability and abilities to obtain and analyze the information in the Set – and so being more and more stable in the Set; seeking for next and next energy sources for more and more “conscious” operating; and, eventually, when some consciousnesses at studying of what happens in the Set have understood what the absolutely fundamental phenomenon “Energy is, such consciousnesses become to be able to create rather arbitrary informational patterns/systems in the Set. Rather probably the “consciousness on Earth” is till now in some initial position on this way.

### III. General fundamental problems

Above, the utmost common answer to the Meta-physical question “what is Matter at all?” is given. According to it, Matter absolutely for sure is an informational system of informational patterns and sub-systems, which are particles, fields, bodies, cosmological objects, etc. In this section, we present a number of rational, and so rather possibly adequate to the reality, answers to problems in the framework of the common fundamental question: why this informational system is as it is. This question sometimes is claimed as is beyond physics – “physics answers on the question “how”, and don’t answer on the question “why””, correspondingly these really existent problems in physics don’t exist, and are solved “by default” by postulating of some physical parameters to really defined only in concrete theories material objects, as that happens, say, with problems “what is a particle?”; “field”?, etc., which mostly are considered as solved in physics, despite their really transcendent nature.

#### A. “What is Matter’s logical base”

The answer with a large probability must be, and so is in this informational physical model, in accordance with two indeed utmost fundamental findings in XX century, which, though were really transcendent brilliant guesses earlier, but in the “Information as Absolute” concept become to be quite natural:

- in accordance with the outstanding von Weizsäcker’s 1953-54 year “Ur-hypothesis” [20, 21] that if Matter is based on fundamental depth on a binary logic, then the space should be 3D, and Matter’s spacetime indeed has 3 space dimensions. That was, on one hand, the outstanding hypothesis that explains why Matter’s space is 3D, and, on the other hand, the fact that the space is indeed 3D is the mighty evidence for that the hypothesis can be correct, and

- in accordance with the outstanding Fredkin-Toffli’s finding [22], who showed that if some patterns in a system are based on a reversible logic, the system changes at interactions in it without energy dissipation outside the system. In this case, Matter that would be dissipation somewhere in the Set; thus seems thrifty Matter’s Creator used this fact; and so in Matter the energy conservation law acts.

Correspondingly (see section II.B.6.) the concrete spacetime of the concrete binary informational system Matter has 3 “purely space” dimensions. Since this system is dynamical system, as that follows from experimental data, the spacetime has the “true

time” dimension,  $t$ , which is absolutely universal and common for all dynamical elements of the Set. Further in this paper, as that is in the whole informational physical model [1], [4], [5] by some reason (see below) instead of “ $t$ ” for the true time dimension is mostly used “ $ct$ ”,  $c$  is the standard speed of light.

Besides the dimensions above Matter’s spacetime has once more dimension, to implement the degree of freedom of the reverse sequences of changes, which are in a sense “non-legitimate” in the true time, as some “travels backward in time”, what is principally prohibited in the true time. The dimension is really a specific space dimension, however it is actualized in many traits in the Matter like the true time. This dimension is called the “coordinate time”, “ $\tau$ ”, dimension in the informational physical model since that is just the “time what clocks show” [more see below], and mostly further for this dimension the metrics “ $c\tau$ ” is used.

Thus the Matter’s spacetime is the [5]4D Euclidian spacetime as an empty container, where Matter exists and constantly changes, with the metrics ( $c\tau, X, Y, Z, ct$ ), where “ $c\tau$ ” is the “coordinate time” dimension, “ $ct$ ” is the true time dimension, and  $X, Y, Z$  are 3 “ordinary” space dimensions. The dimensions, as that is shown in Sec. II.B.6. above, are principally infinite by definition of Space and Time.

With the notion “spacetime” in physics there exist next fundamental problem:

## B. “Is Matter’s spacetime absolute or not”

This problem did not exist in mechanics till the fundamental Nature EM force was discovered, or even in first years after development of the Maxwell-Lorentz theory, where EM objects, events and processes existed and happened as some disturbances in some “ether”, fixed in corresponding absolute Euclidian space. However, in late 1800s it became clear, that seems as the application of very mighty relativity principle to EM processes and events results in some paradoxical consequences, as, say, the “relativity of simultaneity”. It also seemed that because of the principle it is impossible really to observe absolute space and corresponding absolute motion of bodies.

H. Poincaré wrote about the absolute motion in “Science and hypothesis” [23]:

“... Again, it would be necessary to have an ether in order that so-called absolute movements should not be their displacements with respect to empty space, but with respect to something concrete. Will this ever be accomplished? I don’t think so and I shall explain why; and yet, it is not absurd, for others have entertained this view... I think that such a hope is illusory; it was none the less interesting to show that a success of this kind would, in certain sense, open to us a new world...”

However, from that the absolute space even indeed cannot be observed evidently does not follow that it doesn’t exist. Nonetheless that was postulated in the first version of the special relativity theory (SR) in 1905 [24]. It was also postulated that there is no corresponding (“luminiferous”) ether, which would be placed in the absolute space, and be a base of some absolute reference frame. So the SR was – and is till now - based on one more postulate that all/every inertial reference frames are absolutely completely equivalent and legitimate.

From the last postulate any number of evidently meaningless physical, logical, biological, etc., consequences directly and unambiguously follow, the simplest one is the well known “Dingle objection to the SR” [25] and its more known and more

complex version “twin paradox” [13], etc. As well as the fact that all inertial frames cannot be absolutely completely equivalent was proven by Zeno yet 2500 years ago. Indeed, in all reference frames, where Achilles and the turtle move with different speeds, Achilles really leaves the turtle behind, in spite of that is logically prohibited, if the motion of both is continuous – because of “illogical”  $\Delta p \Delta x \geq \frac{\hbar}{2}$ . But that is inessential in the unique preferred frame, where the turtle is at rest; in this frame Achilles runs behind the turtle without any logical problems.

From even one meaningless consequence, which directly and unambiguously follows from the postulates above, it completely rigorously follows by “proof by contradiction” that Matter’s spacetime is absolute; and that follows from the definitions of Space and Time in Sec. 2 above as well. However, these SR postulates have been stated as true postulates in physics till now.

Correspondingly observation of the absolute motion, i.e. the motion of a body in the absolute 3D space, is only a technical task, which can be principally solved, as that is shown in the informational physical model, and the absolute velocity of a pair of clocks can be measured yet now [8], [9].

### C. “An “ether” may or not exist in Matter”

The interpretation is well grounded of the existent experimental data that Matter’s spacetime as the absolute [5]4D Euclidian spacetime with the metrics  $(c\tau, X, Y, Z, ct)$  in the Sec. III.A. It therefore seems quite rational to suggest that the dimensions of the spacetime relate to the degrees of freedom at changing states of some analogues of the von Weizsäcker’s “Urs”, though, of course, not literally, the [5]4D fundamental binary reversible logical elements (FLE). The corresponding introduction of fixed in the absolute spacetime above ether, i.e. a [5]4D dense lattice of the FLEs, as that is made in the informational model, is rational as well.

Besides, in the model, basing on existent experimental data, it is postulated also that all the [5]4 FLE “sizes” (in the spacetime metrics above) are identical and equal to the Planck length,  $l_p$ . The changing of the binary FLE states, “FLE flips”, time interval is equal to the Planck time,  $t_p$ , therefore motion of material objects in the spacetime happens as “equal footing” in all [5]4 dimensions of the spacetime with velocities that have identical absolute values being equal to standard speed of light  $c = l_p / t_p$ .

This postulate of [5]4D FLE ether allows to clarify a number of other fundamental physical problems:

### D. “What is “a particle””

In official physics, particles really are principally transcendent items – since they are some objects of the transcendent “Matter”.

Besides from the informational concept above and from experimental data that particles — which absolutely for sure are informational patterns/systems — are some objects that constantly change their states, however, at that, they are stable, it looks as completely rationally follows that particles are some cyclic close-loop algorithms,

- that cyclically change their internal states with frequency  $\omega$  so that a particle has energy  $E = \hbar\omega = mc^2$ ,  $m$  is the inertial mass,  $\hbar$  is the fundamental elementary physical action, reduced Planck constant,  $c$  is the speed of light. This hypothesis appeared as early as in 1920 as the “the Zitterbewegung”. de Broglie hypothesis [26], [27].

A few naturally suggested, and postulated in the informational model, rational premises follow from that above:

(i) – particles are some cyclic disturbances of the FLE lattice, which appear when a 4D momentum impacts on an ether FLE, which, after the impact, “flips” further causing sequential flipping of neighbor FLEs.

To cause a flip – and the corresponding sequential flipping of ether FLEs along a straight 4D line is enough infinitesimal momentum when the “FLE flipping point” propagates in the 4D ether and 4D sub-spacetime with metrics  $(c\tau, X, Y, Z)$  with the speed of light,  $c = l_p / t_p$ . However, if the momentum is not infinitesimal, the flipping point can not propagate in the lattice with the speed faster than  $c$ . Thus, the unidirectional motion transforms into a “helical” “FLE flipping point” motion along some 4D “helix” of cyclic sequentially flipping – and precessing FLEs in accordance with some close-loop algorithm. Note also, that in this case the “flipping point” moves along “helix” with the speed  $c\sqrt{2}$ , as the flipping of FLEs happens “diagonally”, nonetheless the “helix front” moves along the impacting/creating 4D momentum direction with 4D speed of light,  $\bar{c}$ .

However, some “a helix’s 4D axis” does not exist as a 4D vector in the 4D sub-spacetime, so the propagation of the disturbance in the ether transforms into propagation of, possibly, propagating in the ether bi-vector or a tensor, and so this propagating is essentially not “point-like”- in both, in the spacetime and in the ether. Nonetheless the propagation has the direction – the direction of the impacting momentum’s vector. Besides, the “helix” of FLE lattice disturbance experimentally is observed as a pointlike particle interacting with other pointlike particles. It seems rational to suggest that “pointlike interactions” are interactions of the particles’ FLEs, i.e. the “size of interaction point” is near Planck length, even though the whole disturbance “a particle” is not pointlike, and the position of the point is randomly distributed in some non-pointlike spatial region.

Besides, the observed projection on the 3D space of 4D helical propagating of the FLE flipping point essentially determines that particles propagate in 3D space as “waves” (but interact as “points”); what is observed as the “wave-particle duality”

(ii) From the existing experimental data it seems rational to suggest (in first approximation, see point (i) above) that the “radius” of the “helix” is equal to the particle’s Compton length  $\lambda = \frac{\hbar}{mc}$ , and the corresponding “helical” angular momentum of the particle’s “FLE flipping point” is equal so to the Planck constant  $\hbar$ .

(iii) The always moving particles are, thus, some “gyroscopes” which are always oriented relating to the propagating direction, and

(iv) Note also, that it follows from the experimental data that there are two main types of particles in Matter, depending on the parental 4D momentums. In the model that are “S-particles”, created by spatial momentums, and “T-particles”, created by momentums that were directed in the “coordinate time”, i.e. along the  $c\tau$ -axis.

So S-particles, e.g., photons, always move in 3D space only with the speed of light, T-particles move in “coordinate time” dimension with the speed of light, if are at rest in the absolute 3D space. If a T particle moves also in space after a space directed momentum, its speed in the “coordinate time” dimension decreases by the Lorenz factor in accordance with the Pythagoras theorem.

Note, though, that the above in this section relates completely only to fundamental particles. If a particle is composed from some fundamental particles, some points in the above are not valid.

And, besides, note that extreme impacts on FLE can result in many comparatively stable close-loop algorithms, and that is observed experimentally – the observed particles zoo now contains a more than a few hundred items – some chimeras that are composed from some fundamental particles, truncated algorithms, as that, say, rather possibly muon and tau-lepton truncated electron’s algorithms are; 2-nd and 3-rd generations of quarks, as well, etc. Most of the algorithms have some defects, and so can break on some algorithm’s tick with some probability, so such particles decay exponentially in time.

Note also, that from that everything in Matter is/are some disturbances of the FLE lattice that are constantly moving with the 4D speeds of light, it follows that for observing of the absolute space there is no necessity to point some “anchor” that is at rest in the space. Any T-particle (body...) in any space point that moves only along the  $c\tau$ -axis with the speed of light is at absolute rest.

## E. Few notes relating to other fundamental problems

### 1. Problems that are considered in detail in [5a, <https://arxiv.org/abs/0707.4657> v5]

The solutions and clarifications of the Meta and general problems above allowed to solve, or to clarify a number of concrete physical problems, such as what really are the Lorentz transformations in special relativity [29] and the Lorentz-Poincaré theory [30]-[32]; what is a particle’s spin and why neutrinos have non-zero rest mass; what are the physical action and the “minimal physical action” principle.

Besides, that allowed to propose rational physical solution of the problem “what are the fundamental Nature forces”, and to develop rational models of two ones – Gravity and Electric Forces. The models are based on proposed models of these Forces’ charges, and solve, essentially probably, a few problems – why the fundamentally different inertial and gravitational masses are equivalent at least at statics; why the Gravity force in a number of tens orders of magnitude is weaker than other forces; why  $\alpha\hbar c = e^2 / 4\pi\epsilon_0$ ; what is the magnetic force, including the proof that a magnetic monopole [38], [39] doesn’t exist. The models are based on postulates that, in contrast to QFT, the Forces’ mediators are real – not virtual – specific disturbances in the FLE lattice that are created by the Forces real charges, nonetheless the interactions are essentially quantized. At that the quantum nature of Gravity can be yet now observed in

proposed experiments with photons [1], [6]. In the model a few other experiments are proposed, which are tests of both – of the model, and of corresponding standard physical theories.

## 2. “What are antiparticles”

Note, that the answer on this question is possible only if this problem is considered again in the absolute [5]4D Euclidian spacetime metrics  $(c\tau, X, Y, Z, ct)$ , where particles are always constantly moving with 4D speed of light  $\bar{c}$  in the 4D sub-spacetime with metrics  $(c\tau, X, Y, Z)$  having the 4D momentums  $\vec{P} = (p_{c\tau}, p_X, p_Y, p_Z)$ ,  $\vec{P} = m\bar{c}$  (and particles’ energies  $E = Pc = mc^2$ ),  $P^2 = \sum_{j=1}^4 p_j^2$ ; and, simultaneously, are moving in parallel, in 1D  $ct$ -dimension with the speed of light and the momentum  $\vec{P} = m\bar{c}$ .

In the model in complete consistence with existent experimental data it is supposed – and postulated, that antiparticles, are, as the particles above, also some close-loop algorithms, which are the same as corresponding particles’ algorithms, but the algorithms run in reverse command order, having so for T-particles/T-antiparticles opposite momentums in the  $c\tau$ -dimension,  $p_{c\tau}$  (particle) =  $-p_{c\tau}$  (antiparticle).

In contrast, since in Minkowski space the dimension/variable “ $t$ ” is really some mix of the true time,  $t$ , and coordinate time,  $\tau$ , so “4-momentums” in SRT,  $\vec{P}_M$ , physically are rather strange:  $\vec{P}_M = (\frac{E}{c}, p_X, p_Y, p_Z)$  i.e. the zero component of a 4-momentum of a particle is, in fact, the whole real 4D momentum – and the momentum in true time, whereas really the “ $t$ ” in Minkowski space has also the coordinate time traits, as it is the “proper time” of, a moving in a “stationary” frame, frame. Besides, that is “the time, which clocks read”, which (clocks) are usually some T-bodies, and really show how they move in the coordinate time dimension.

Though note that in a rigid reference frame really it is impossible to observe motion in the true time.

So in Minkowski space – as that really is fundamentally in true time - in the time dimension there is no backward in time motion, and antiparticles do not exist in SRT.

Correspondingly, when Dirac developed in framework of SRT QM equation for fast moving free particle - electron, he made that as modification of existent already non-relativistic Schrödinger time dependent equation  $i\hbar \frac{\partial}{\partial t} \psi(\mathbf{r}, t) = \hat{H} \psi(\mathbf{r}, t)$ , where  $\psi$  is

the wave function of a particle,  $\hat{H} = \sum_{j=1}^3 \frac{\hat{p}_j^2}{2m}$  is the Hamiltonian operator, which

corresponds to the classical mechanics Hamiltonian  $H = \sum_{j=1}^3 \frac{p_j^2}{2m}$ ,  $\hat{p}_j = -i\hbar \frac{\partial}{\partial x_j}$ ,  $j=1,2,3$ , are [really partial] operators of 3D space particle’s momentums;

- and using, instead of classical Hamiltonian above, the relativistic Hamiltonian  $H = c\sqrt{p^2 + m^2c^2}$ , where  $p$  is the absolute value of 3D momentum,  $p^2 = \sum_{j=1}^3 p_j^2$   $m$  is rest mass of a particle,  $c$  is the speed of light.

This Hamiltonian has the 3D space momentums in the square root, and so it is impossible to obtain directly linear differential equation for the wave function using the momentums operators above – as that is made in the Schrödinger equation. However Dirac solved this problem by beautiful non-standard way; in which, besides, the Pauli spin formalism was taken into account quite naturally, wave function of particles turns out to be 4-component vector that describes particle's complex quantum state – what looks as indeed adequate to the reality, etc. So in the equation the “Dirac Hamiltonian” is  $\hat{H} = mc^2\alpha_0 + c\sum_{j=1}^3\alpha_j\hat{p}_j$ , where partial momentum operators are the same as in Schrödinger equation above,  $\alpha_0$  and  $\alpha_j$  are the four  $4 \times 4$  matrices, which determine the four-component – in contrast to the one-component  $\psi$ -function in Schrödinger equation,  $\psi$ -function. The equation is in complete consistence with the SRT formalism, including that happens, if in this Hamiltonian  $mc^2$  has negative value – what formally is possible because of, as that Dirac told, e.g., on the first “Atomic nucleus” conference in the USSR [34] (translated from Russian):

“...In Newton mechanics kinematical energy  $W$  is always positive. But in Einstein theory.  $W$  is defined by more complex equation, namely

$$W^2 = m^2c^4 + p^2c^2,$$

from what

$$W = \pm\sqrt{m^2c^4 + p^2c^2}$$

In classical theory from both signs always + is chosen, what does with purpose to obtain accordance of the theory with experiment.

That creates no difficulties, since from our equations is seen, that  $W$  can be only more than  $+mc^2$ , or lesser than  $-mc^2$ . That connotes that the states with positive kinetic energy are separated from the states with negative kinetic energy by the interval  $2mc^2$  (from  $+mc^2$  to  $-mc^2$ ), and, since in classical theory all dynamical variables are continuous, so a particle, which had firstly a positive kinetic energy, by no means can to transit into a state with negative energy. By different way that is in quantum theory: the wave equation has the property that existence of some disturbing force obligatorily creates for the particle a probability of transition from initial state with positive kinetic energy into a state with negative kinetic energy:: therefore in quantum theory it is impossible simply to ignore a possibility of negative kinetic energy, as that is in classical theory ...”

Finally, the obtained equation is

$$i\hbar\frac{\partial\psi(x,t)}{\partial t} = (\alpha_0mc^2 + c\sum_{n=1}^3\alpha_n p_n)\psi(x,t);$$

where the Dirac's approach above is introduced as “hole theory”, that the vacuum is the many-body quantum state in which all the negative-energy electron eigenstates are occupied. This description of the vacuum as a "sea" of electrons is called the Dirac sea.

The approach looks as rather questionable, since “negative-energy states” for free particles really don’t exist.

However if Dirac would consider this problem as the “momentum problem”, he could consider, instead equations for energy above, the equation for the momentum

$$m_0\vec{c} = \pm\left(\frac{W^2}{c^2} - p^2\right)^{1/2}$$

- where the sign “±” for the vector momentum  $m_0c$  is undoubtedly legitimate – unlike to scalar energy  $W$  above, and so the hypothesis about the particles that move with negative speed of light – oppositely to electrons, would be physically legitimate as well.

And really the Dirac equation is practically the equation for the momentum, if both sides are divided by  $c$

$$i\hbar \frac{\partial\psi(x,t)}{\partial(ct)} = (\alpha_0 mc + \sum_{n=1}^3 \alpha_n p_n)\psi(x,t)$$

- however that would be, nonetheless, again impossible in framework of the SRT, where such momentums don’t exist.

Really – see above – the T-particles electrons, and positrons, are created by oppositely directed in the  $c\tau$ -axis momentums, and that above is, besides, the answer on the problem

### **3. “What is the “Feynman–Stueckelberg interpretation” in QED [35], [36], where it is postulated that antiparticles move backward in time”**

The motion with negative speed in the  $c\tau$ -dimension practically for sure happens in Matter, if, as that is again rationally suggested and postulated in the informational model, the antiparticles have the same algorithms as the corresponding particles, but their algorithms run in reverse command order, therefore

- the antiparticles really move backward, however not in the true time, but backward in the coordinate time, which is just “the time what clocks read”, and which really is measured as experimental base of physical theories. It also matters that existent clocks are made from particles, and so real positions and motion of antiparticles on the  $c\tau$ -axis are experimentally non-observable. If it would be a possibility to make a clock from antiparticles, that would be possible – as observation that on such clock the pointer rotates oppositely to the pointer on its made from particles twin.

Note, though, also – the coordinate time is not the time; and so, for example, if there would be two twins, one “material” and the other “antimaterial”, their clocks would show opposite signs of their ages. However, both twins will seem practically identical as usual twins, since biologically both they would age principally in accordance with fundamentally non-material biological laws. Not completely, though - moving in the space both twins would biologically age slower than if are at absolute rest.

Finally, addressing here to the “what is particle/antiparticle?” problem above, add a couple of some common notes else. First one relates to the main dynamic parameters of particles motions, energy and momentum:  $\vec{P} = m\vec{c}$  and  $E = Pc = mc^2$ . That looks as that the momentum, which has direction that is determined by what degrades of

freedom, and in what ratio, were actualized at concrete interactions, transport correspondingly changed informational pattern “particle”, the mass of which is essentially determined just by its logical structure, with the speed of light in corresponding direction in the 4D sub-spacetime, whereas energy transport the whole, though essentially disconcretized, information about current state of the pattern with the speed of light in the [true] time dimension [we say here about what happens in “absolute frames”, where all parameters of material objects, including energy and momentum values, are real], in accordance with the absolutely fundamental principle that any information cannot be non-existent, and so even if some change happened when a pattern/system remains be fixed in a same space position, its changed state cannot to “erase” the former state replacing it, and so must be placed somewhere else i.e. at least in another point on true time dimension.

Since what happen in Matter in this scheme/sense practically for sure happens in any other dynamical informational system in the Set, this fact, which reveals itself now for humans only in Matter, rather probably can be useful at studying of the utmost fundamental phenomenon “Information” as a whole.

Other note relates to the “particle at rest in space” problem. In standard QM it is stated that if a particle is at rest in 3D space, then, as that follows from corresponding solution of Schrödinger equation, its position in 3D space is infinitely uncertain, i.e. a particle, if is at rest, exists in whole infinite Matter’s space, since corresponding wave length is infinite. It looks as that would be rather strange if that would really happen in Matter, and really that doesn’t happen.

The problem relates, of course, only to T-particles, which can be at a space rest, so have rest masses, since were created by momentums that were directed along the  $c\tau$ -axis. Correspondingly really the particles never occupy in space infinite volume, and really, if a such particle is at the rest, it occupies a well limited space volume with size  $\sim$  particle’s Compton length, moving with the speed of light along the  $c\tau$ -axis, as sequential FLE flipping along 4D “helix”, which has the  $c\tau$ -axis as its 4D “axis”.

That is another thing, that this 4D “helix” exists as having strangely simultaneously existing 3 equally equivalent, mutually orthogonal, projections on 3the three 3D space planes, however that isn’t important in this case, the particle’s motion is, nonetheless, localized in the space by the characteristic in this case the particle’s Compton length scale size.

Though here some really “whole uncertainty” exists – that is the uncertainty of in what direction in whole  $4\pi$  solid angle a particle “moves”, what really is senseless, since the particle doesn’t move, and the problem above appears not when a particle is at rest, but only if it moves, after some impact and transmission to particle corresponding momentum,  $p$ , in a certain space direction, with a 3D speed  $V$ . This motion along 3D space helix, the front of which moves with the speed  $V$ , is observed in physics as the de Broglie wave that has the length  $\lambda_B = \hbar / p$ . It is more certain than the 4D “helix” motion of the “generic” 4D FLE flipping point motion, and instead of the flipping point in this case along the 3D helix the “generic” 4D “helix” moves, however in both cases, when a T-particle is at space rest and moves in the space, it interacts as a “point” that has FLE size, i.e. practically for sure Planck length size.

## IV. Cosmology

There are many problems in cosmology, first of all, in some cases of principally insurmountable uncertainty even in the formulation of these problems, when this physical branch relates to objects, events, and processes, which humans cannot study now in controlled or at least observable, conditions.

Moreover, many of these problems can not be principally rationally solved or clarified in mainstream physics, i.e. outside the “Information as Absolute” concept and the physical model, because of the fundamental transcendence of the phenomenon/notion “Matter” in the mainstream philosophy and science. However, the informational physical model allows to consider a few problems rationally enough

### A. The “Beginning problem”

This is an utmost fundamental problem in cosmology, and it is rather evidently principally irresolvable in framework of official physics. Physics has no reliable data about the objects, events and processes that could exist, appear, and happen at Beginning. Nonetheless a number of theories exist in physics, and in the standard cosmological “Big Bang” model [40] it is suggested concretely that

“... As the Big Bang theory goes, somewhere around 13.8 billion years ago the universe exploded into being, as an infinitely small, compact fireball of matter that cooled as it expanded, triggering reactions that cooked up the first stars and galaxies, and all the forms of matter that we see (and are) today.....”

- in spite of that the existent physics principally is not applicable to this “infinitely small, compact fireball of matter”, etc., and so principally isn’t able to rationally suggest – which, why and how some reactions cooked up the first stars and galaxies.

As well as to the next steps of Matter’s creation, when in the model

“...more explosive phase of the early universe at play: cosmic inflation, which lasted less than a trillionth of a second. During this period, matter — a cold, homogeneous goop — inflated exponentially quickly before processes of the Big Bang took over to more slowly expand and diversify the infant universe.....”

- existent physics knows absolutely nothing about what was this “cold, homogeneous goop”; why “it inflated exponentially quickly before next processes of the Big Bang”, by what reason this “inflation” stopped; and further by what reason and how that “took over to more slowly expand and diversify the infant universe”, etc.

Nonetheless, there exist, basing on existent astrophysical data, a number of seems as rather rational points in standard model of Matter’s evolution after Beginning, including, if we do not take into attention the remark above, the rather rational “phenomenological” description of states in Matter evolution above,

- starting from the “space inflation” state/epoch [41], [42], when the space, in the standard model for unknown reasons, and by some transcendent way, appeared and exponentially expanded, and that happened at some relaxation of some completely unknown in physics “inflaton” field’s singularity, because of “a repulsive gravitational force” (?) [40]. However, the “inflation hypothesis”, in spite of these rather questionable

points, seems adequately to the reality phenomenologically describes the observed uniformity of matter density and of the material objects nomenclature on cosmological distances, the nucleosynthesis, etc.

Including the hypothesis in the standard model that during inflation the matter was a cold, homogeneous goop, seems is rather plausible, since that is consistent with cosmological observations. However, that contradicts with the assertion that the matter “exploded into being, as an infinitely small, compact fireball” in this model in the quote above.

The informational approach allows to formulate reasonable physical hypothesis [3], [5] in accordance with the existent experimental data and with reasonable points in the standard Big Bang model above, such as the inflation epoch, and that the Matter after the inflation was rather cold, etc.

In the hypothesis it is suggested that the “Information” Set’s element “informational system “Matter”” was created by the other Set’s element, “an informational system conscious smart “Creator””, which was indeed extremely smart and could design a logically simple, however functionally extremely complex, effective, and closed in the Set, informational system; and has found in the Set at creation of this system a few huge portions of the mysterious, including essentially in the concept, till now phenomenon “Energy”.

Thus – see above - Matter is based on the simplest binary and reversible logics + (at least) 4 fundamental logical marks, which humans observe as 4 real fundamental Nature forces, including Gravity, and few universal links and constants, which are “written” in the Matter’s utmost fundamental base - in the correspondingly binary [5]4D reversible fundamental logical elements [FLE].

Further this design was actualized into Matter in the next 3 steps – and portions of energy:

On the first step the [5]4D dense lattice of [5]4D FLE was created (“inflation epoch”) exponentially, as the result of programmed division, possibly into 2, of possibly one “primary FLE” (as that, say, bacteria spread in a Petri dish, if there are enough resources) in the corresponding Matter’s fundamentally infinite, absolute [5]4D spacetime with metrics  $(c\tau, X, Y, Z, ct)$ , Euclidian of course,

- which [the spacetime] “automatically”, i.e. by definition of the absolutely fundamental phenomena “Space” and “Time” – see section II.B.6. above, appeared at the creation yet of the “primary FLE”. Note, though, that this spacetime always existed in the Set, which exists absolutely fundamentally always, i.e. without Beginning and End, as a sub-spacetime of the Set’s whole spacetime. The FLE lattice was cold;

- on the second step, the energy portion with  $c\tau$ -directed momentums was globally uniformly pumped in this FLE-lattice, and there the completely symmetrical primary T-particles were globally uniformly created. It seems as rather probable that the energy was spent only on the particles creation, and so the “primary T-particles” matter in Matter was probably rather cold again.

However, from existent cosmological data it looks as rationally to assume that the pumping wasn’t uniform locally – in the lattice [and so in 3D space] some clusters of

primary particles were created, where the particles density was radically enhanced, which were some seeds of appearing on next Matter's evolution steps large cosmological objects, first of all – galaxies.

At that the next fundamental problem, which exists since reality evidently contradicts with existent experimental data in high energy physics, and corresponding physical theories

### **B. “Why Matter now practically does not contain antimatter”,**

seems to be well rationally solved:

- Matter does not contain antimatter since it did not contain antimatter yet at the second step, because the primary T-particles were completely symmetrical algorithms. In this case it is illogical to consider the difference “particle/antiparticle”. Hence, it was logically completely permissible for all primary T-particles to be only “particles” – i.e. all of which have the positive momentums in the  $c\tau$ -dimension, and

- on the third step the primary particles (which in the hypothesis are rather probably Planck mass particles or other simple particles, i.e. that were symmetric algorithms and have only completely symmetrical gravitational charges) interacted by using only completely symmetrical Gravity force, the result was, rather possibly indeed a soup of, because of the angular momentum conservation law only “ordinary”, particles, which was distributed again globally uniformly – but non-uniformly locally – in the lattice.

In the “soup” unstable particles decayed quickly and – as the standard cosmology asserts rather adequate to the reality – the observable now particles eventually remained, and this soup was rather hot. Hence, CMB exists now, however that possibly was not a “singular” temperature, because the energy was mostly spend on creation of the ordinary particles.

If the primary particles were the Planck mass particles, then nearly  $10^{19}$  “ordinary” baryons were created in an interaction of two particles.

At that Creator practically for sure did not need to control the step-2 and step-3. Creator well knew that nothing besides a concrete informational system “Matter” can appear, if a dull energy is pumped in the FLE-lattice; and, say, this Matter could have a number of thousands of galaxies lesser or more, but for Creator that was not essential.

Thus the hypothesis presents a rather rational answer on the fundamental physical problem

### **C. “What is the “dark matter””**

- it would not be surprising if, say, the “dark matter” indeed exists, being made up from the “primary particles”. That could happen if during the creation of “ordinary” matter only 10-30% of these particles have interacted, and 70-90% of the “relics” exist till now. If these are the Planck mass particles, then the density of the dark matter particles is in  $10^{19}$  times lesser than the baryons' density, i.e. 3-4 particles in a cube with the size 1000 000 m.

Since the primary particles interact only gravitationally, they interact with “usual” particles at a probability extremely lesser than when that for neutrinos, and so (i) - the bodies, stars, etc., are practically transparent for these particles, which rotate around centers of some massive bodies along their single own orbits, forming corresponding haloes, and (ii) – they are practically non-detectable, due both to extremely small cross section and extremely small concentration.

Though if an interaction happens in a detector, that will be well observable,  $10^{19}$  BeV is rather observable energy.

Besides it looks as rather rationally to assume, that in the “seeds” clusters there were some local – and small – regions, where the primary particles density was so large, that the primary particles composed compact objects with extreme mass and Gravity field, which have become centers of galaxies, having masses millions, even billions, of stars.

These objects have some interesting physical trait – the strength of created by the objects Gravity field is so large, that escape velocity becomes be equal to the speed of light, and so, say, even photons, if aren't radiated orthogonal to the objects surface, propagate inside corresponding space volume along closed orbits – such objects so practically don't radiate light.

That happens in both existent theories of Gravity – Newton's theory and general relativity, and happens at least provided that the mass,  $M$ , and radius,  $R$ , of an such object are in accordance with the equation  $R_{gS} = \frac{2GM}{c^2}$ ,  $R_{gS}$  is the radius in GR (Schwarzschild radius), corresponding radius,  $R_{gN}$ , in Newton Gravity is two times lesser. At that the radius isn't the object's radius, really it can be lesser than that radiuses above.

The difference of  $R_{gS}$  and  $R_{gN}$  values isn't principal, however these radiuses principally differ in that when  $R_{gN}$  is the radius of some “virtual” surface, which surround some “dark place”, the Schwarzschild radius is the radius of the “event horizon” in GR, where solutions of the GR equations become to be singular, and so the event horizon is the border of a “hole in spacetime” – a “black hole” (BH), and so nothing principally can escape from this hole.

Really on the event horizon no singularity exists, the potential and strength of Gravity field increase rather smoothly with decreasing of the distance to the center of the object. So, say, the super massive black holes (SMBH) in centers of galaxies, which, rather probably, are offspring of the “seed” objects that were growing absorbing gas and other matter around at galaxies' evolutions, have rather large Schwarzschild radiuses, whereas the sizes of compact objects in SMBH evidently are much lesser than the radiuses.

For example, Sagittarius A\* (SMBH in Milky Way) has mass,  $M=8.2 \times 10^{36}$  kg, and corresponding event horizon radius  $R_{gS}=1.2 \times 10^{10}$  m. So average density of matter in this SMBH,  $\rho=1.1 \times 10^6$  kg/m<sup>3</sup>. This density is much lesser than the density of neutron stars' matter  $10^{17}$ - $10^{18}$  kg/m<sup>3</sup>, and so even if in Sagittarius A\* center some big neutron star would be placed, its radius would be  $\sim 10^4$  times lesser than the Sagittarius A\* “event horizon”.

Thus it looks as rather rational to assume, that in this case the phase of SMBH central object matter state, and any other BH's matter state, though, is the next phase after known now phases "ordinary matter", "white dwarf" and "neutron star" matters' states, and rather probably the SMBH central object is some dense composition of the corresponding the "seed's" primary particles, and of what is transformed from falling into the central object "ordinary" matter. It looks as reasonable to suggest, that in this case some essentially uniform quark structure can be formed, which is stable because some "1-st origination quark degeneracy" – like "electron degeneracy", and "neutron degeneracy" in dwarf and neutron stars matter phases, at increasing of a BH central object's mass and pressure, next originations of quarks can appear, etc.,

whereas in SMBHs the space between the central object's surface and "event horizon" is filled by the accretion disk continuance, and by some other particles that have diffuse distribution; which are practically unobservable outside the horizon.

Nonetheless it looks as rather probable to propose that there don't exist some sharp border for matter in the event horizon. In the mechanics existence of "escape velocity" for some body by no means determines some limits of distances that lesser bodies in the "body's atmosphere" can move on which. If lesser body speed's value is near the escape velocity value, the body can move on practically infinite distance. It looks as rational to suggest, that that is true in the case when the escape velocity is equal to the speed of light as well. Note in this case, for example, that binding energy of an electron – and so the electron's "escape energy" – on the "event horizon surface shell" of Sagittarius A\* is equal  $\sim 259$  keV, what is comparable with a K-shell electron's binding energy  $\sim 116$  keV in Uranium atom.

If that is so, then really a "black hole", besides the accretion disk, has practically for sure, some "atmosphere" – or "hair", which, though, are formed mostly from outer matter. Including in the observed SMBHs' jets, including the "bubbles" of Sagittarius A\* SMBH it is nothing surprising – that are, rather probably, some SMBH "atmosphere's" specific details, which, as that is explained in standard cosmology, are formed by magnetic fields that are formed by the accretion disk and SMBH itself.

Again - more interesting here is the problem what is the phase "black hole matter".

However, it looks as rather probable, that this explanation at least possibly isn't complete, for example the Earth radiation belts that are formed by Earth magnetic field, aren't some jets, moreover, the charged particles in the belts move mostly toward Earth in polar regions – oppositely to the jets.

Though, of course, the magnetic field of some SMBH isn't formed like that the Earth's "dynamo" does, much more probably the field can be, for example, formed by rather probable the huge "neutron star phase matter" skin on the SMBH compact object above, and so the SMBH jets are formed as that happens, including, in the "ordinary" observable pulsars,

- however we cannot exclude that the jets are formed (including in the pulsars) by some other than magnetic force ways also, for example – by gravimagnetic force. To consider this case, though, we should have real theory of Gravity, which doesn't exist till now, however it looks as rather rational to assume, that this effect can exist, and can be observable if an object is large enough, for example that possibly could be Sun.

Correspondingly it looks as probable that at measurements of the spatial distributions of concentrations of ions, neutral particles, other matter, around Sun in the cosmic missions on polar orbits around Sun, the “SMBH features”, i.e. some accretion disk and jets/bubbles can be observed; and, because of that will be made in rather controlled conditions, the measurements’ results in this case would be useful in both cases – at development of SMBH physics, and at development of the real Gravity theory. As well as on the missions some other instruments could be installed, for cosmology studying of some concrete star looks as more useful than, say, studying of planets in the Sun system and seeking for planets in other stars’ systems.

#### D. “What is the “dark energy””

Both interpretations of existent cosmological data as “space expansions”, i.e. the exponential “inflation” on the first step of Creation, and more tolerant next one that rather probably really proceeds till now, really, if happen, are the FLE lattice expansions; and to make that it was – and is – indeed necessary to pump into the lattice essential energy. However, this energy is completely outside physics, and so attempts to incorporate this energy in existent physical theories, as that is in cosmology as the introducing of Lambda term in the GR equations, which determinates “space expansion”, really are irrational.

Though, as that is in the Beginning model above, this (in the model – Creator’s) energy can be used in rational descriptions of what and how happened in first instants at Beginning, or, for example, when for description of the FLE lattice expansion after appearance of “ordinary” Matter it looks as would be possible to find some rational reasons as well. For example, this expansion would be necessary to prevent Matter’s collapse because of the “gravity paradox” [43]; though here can be many other reasons, of course.

### V. Conclusion

This paper, in fact, is some “conclusion” for the existent now series of papers, where the “The information as Absolute” concept, the informational physical model, and concrete physical problems in framework of the concept and the model, are considered. Hence, a typical conclusion would be too long for this paper.

So here only a few final remarks that relate to possible development of the model and its application in physics.

Firstly, more rational versions of traditional physical theories should be developed. The current theories are mostly based on the SRT formalism, first of all, on the postulate that real Matter’s spacetime is the 4D Minkowski space, and so the phenomena “Space” and “Time” are actualized in the theories really erroneously.

Instead physics should be re-formulated in accordance with the fact that real Matter’s spacetime is the absolute [5]4D Euclidian spacetime with the metrics  $(c\tau, X, Y, Z, ct)$ , where, including, time doesn’t flow somewhere. However, in everyday physical practice rather probably the passed way of a body formula will be as it is now,

$S = Vt$ , where the time “ $t$ ” “of itself, and from its own nature flows equably”; but not can be “dilated”, though.

Correspondingly in this case it is necessary to develop the theory of the [5]4D angular momentum, Hamilton and Lagrange functions, etc.; note also that in this case the least physical action principle looks as is based more physically, and, after the mechanics’ reformulation, it will be necessary to re-formulate corresponding QM operators, including in this case a next fundamental physical problem

“Why time in QM does not have a corresponding operator”

- would be solved as well.

This problem, though, appears also because of other fundamental problem – that the time-dependent Schrödinger and Dirac equations are fundamentally – and so really essentially – incorrect, since are as  $i\hbar \frac{\partial \psi}{\partial t} = \hat{H}\psi$ , whereas, at that, in QM the

derivations by other than time observables/variables  $\hat{p}_j = -i\hbar \frac{\partial}{\partial x_j}$ ,  $j=1,2,3$ , are

operators of 3D momentum. It looks as quite natural, that the derivative by the observable “time” is also the momentum operator, and so the equation for wave function really should, rather probably, be as  $i\hbar \frac{d\psi}{d(ct)} = \hat{P}\psi$ ; where the whole

momentum operator  $\hat{P}$  is composed from the partial operators  $\hat{p}_j = -i\hbar \frac{\partial}{\partial x_j}$ ,  $j=1,2,3,4$ ;

though taking into account that these operators aren’t independent, since  $P^2 = \sum_{j=1}^4 p_j^2$ .

In this case the observable “time”, more correctly – both, true and coordinate times, observables, become to be “ordinary” observables, and so have the operators – themselves, as that 3 space observables are now in QM.

However, that isn’t only QM problem – this problem has the root in the Hamiltonian and Lagrange formalisms in classical mechanics, where the variable time also essentially differs from the spatial variables; first of all, because of the Newton-SRT definition of time (see the section II.B.6. above); and the re-formulation of classical and SRT mechanics that is pointed above can be essential for the QM re-formulation.

Returning to the other QM problems note also that at considering of QM events and processes in absolute frames, when some QM objects are free, the problem of causality, which occurs in some cases in standard physics, doesn’t appear, since in this frame all clocks show real positions of objects in the true and coordinate times, which (positions) have in this case the same values.

Besides, a re-formulation of QM, if would take into account the really existent [5]4D FLE ether, possibly will result in better understanding of the QM phenomena; including, possibly, of really existent fundamental problem “What is the Pauli principle,

and is or not the force that limits number and spins of fermions in a given state a “fifth fundamental Nature force” or that is something else?”

Note, though, that introducing the FLE approach in Standard Particles Model and QFT seems will be more fruitful, first of all in the last case – at solution of the “virtual particles” problem.

In Standard Model, the version of CPT theorem allows to obtain rather questionable results, such as the solutions [44], [45] of the section V.B. [matter-antimatter asymmetry] problem; where at Beginning both “Matter” and “AntiMatter” appeared, and, in accordance with the CPT theorem, they then immediately turned out to be divided in “spacetime” and in “antispacetime” (?); just so Matter does not contain antimatter now. Such solutions, which are in accordance with the theorem look as rather strange, and thus the CPT theorem must be reformulated as well.

Besides it seems rational to suppose that the popular in the mainstream physics problem of “development of the “[Grand] Theory of Everything” which will “unite” all existent fundamental Nature forces, really is not actual. Really Forces are functionally fundamentally different, and so rather possibly really here is no any necessity in some “unifications”, besides what is now already – really the correct mechanics, which describes motion and interaction of material objects basing on the utmost fundamental and universal Matter’s laws/links constants is the “Theory of Everything” already, and inclusion in concrete cases in the mechanics equations of potential energies of concrete fundamental Nature forces variables isn’t a principal point.

Though some “unifications effects” can appear, mostly at exotic energies, when problems with sufficiency of numbers of FLEs in some particles algorithms’ to mark all the particles’ charges (what doesn’t appear in more tolerant conditions), can appear at some interactions of the particles; and corresponding observed effects can be used at development of Standard Model, though not as some “unifications”, but as some revelations of usually non-detectable traits and parameters of FLE logical structure.

However utmost important problems now are (i) - the problem of “virtual” particles and interactions in existent quantum dynamics theories, which should be replaced by real ones; for QED and QGD rather possibly that will be made basing on the FLE approach and taking into account the initial models of Gravity and Electricity Forces (Sec.2.9 in [5a]); that is true for classical ED and GD, of course; and (ii) what relates to all – classical, quantum, and for the initial models – the problem of what is the energy/momentums that the Forces transmit to particles at mediators’ impacts?

Etc., more see the main text.

Finally note that the experiments, which are proposed in the informational model, i.e.:

(1) - the observation of the absolute motion and measurement of the absolute velocity of the peculiar motion of the Solar system [8] , [9]; though it would be not too surprising, if the measured absolute velocity will be the same as which follows from the CMB dipole measurement, because from this model of Matter’s creation in section 5 it follows that Sun – as any other macro object in Matter’s space – is in essentially a cold the space region, and so hasn’t some exotic absolute speed. Note, though, that there exist other estimations of the velocity at observations of quasars, distant AGNs or SNe

Ia, which results in the velocity values that are essentially larger than the CMB dipole value [46]; and so this experiment's results would be useful at solution of this puzzle as well;

(2) - the observation of the quantum nature of Gravity [1], [6], and

(3) - the important, simple and cheap, though not really fundamental, experiment [10] (viXra file version), which, rather probably, will show that the GR postulate that photons at motion do not change their energy in gravitational fields between points that have different potentials, is wrong; and

(4) – measurement of distributions of density and momentums of charged and neutral low energy particles and matter around Sun by instruments on polar orbits (section 5.3);

- should be made as soon as possible.

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## Appendix A

Brief comments to the published fundamental physical problems list in

**Roland E. Allen and Suzy Lidström**

“Life, the universe, and everything – 42 fundamental Questions”

[<https://arxiv.org/abs/1804.08730>]

### 1. Motivation for this article

- that is rather representative list of fundamental physical problems, and so it is worthwhile to comment this list basing on the informational physical model.

### 2. Gravitational and cosmological mysteries

#### 2.1. The cosmological constant problem

- this problem really is outside physics, more see in the main text.

#### 2.2. The dark energy problem

- this problem really is outside physics, more see in the main text.

#### 2.3. Regularization of quantum gravity

- this problem is essentially clarified, and corresponding experiments are suggested, see [2], section 2.9. Mediation of the forces in complex systems.

#### 2.4. Black hole entropy and thermodynamics

- no comments.

#### 2.5. Black hole information processing

- no comments.

#### 2.6. Cosmic inflation (or an inflation-like scenario)

- this problem is essentially clarified, see the main text, section “Cosmology”.

#### 2.7. Cosmological survival of matter (and not antimatter)

- this problem is rather possibly principally solved, see the main text, section “Cosmology”.

#### 2.8. Composition of dark matter

- this problem is possibly rationally elaborated, see the main text, section “Cosmology”.

### 3. Understanding and going beyond the Standard Model of particle physics

#### 3.1. Origin of family replication

- this problem is outside physics, more see in the main text.

#### 3.2. Origin of particle masses

- inertial mass is actualization of the logical resistance of informational patterns/systems to changes, more see the main text, section 5. “What is “Inertia””

#### 3.3. Supersymmetry and the hierarchy problems

- these problems, as that are formulated in the Standard Model, rather probably really do not exist in physics.

#### 3.4. Explanation of the fundamental grand unified gauge group

- with a rather large probability the “grand unification” problem does not exist as a physical problem, and the fundamental Nature forces are practically independent of each other. Though, at high energies the running of particles’ algorithms are essentially deformed, so in such cases an interference of the Forces is possible. More see in the main text and [2].

#### 3.5. Potential violation of Lorentz or CPT invariance

- the Lorentz transformations are completely valid on macro scale, where the transformations link macro objects “inertial reference frames” and the Voigt-Lorentz decrement can be formed, and they are completely valid only if the macro system of frame instruments and studied bodies are rigid and compose rigid systems. If that is not so, application of the transformations is limited, more see [2]. section 2.4. Lorentz transformations.

#### 3.6. Apparent marginality of the Higgs self-coupling, and stability of our universe

- these problems, as that are formulated in the Standard Model, rather probably really do not exist in physics.

#### 3.7. Quark confinement and related issues

- no comments

#### 3.8. Phases of quantum chromodynamics and general systems with nonabelian gauge interactions

- no comments

### 3.9. Additional undiscovered particles

- no comments, besides that there can be a lot of close-loop disturbances in the FLE lattice, which can live more than on cycle, i.e. would be “particles”.

### 3.10. The unlimited future of astrophysics

- no comments.

## 4. The exotic behavior of condensed matter and quantum systems

4.1- 4.6 – no comments.

## 5. Deep issues

### 5.1. Higher dimensions, with geometry and topology of an internal space

- Matter’s utmost fundamental and universal spacetime is the absolute, fundamentally “flat”, [5]4D Euclidian spacetime with the utmost fundamental and universal metrics  $(ct, X, Y, Z, ct)$ , where the dimensions relate to corresponding degrees of freedom at FLE states changes. In principle a number of dimensions could formally essentially more, if some formal dimensions that relate to other than the utmost fundamental decreases of freedom at changing of FLE state, for example, that relate to fundamental forces charges, would be included in the spacetime metrics, however now it seems that that will not contain some additional physical sense, Other than Euclidian flat spacetime “topologies” cannot be adequate to the reality. More see in the main text and [2].

### 5.2. Validity of the multiverse idea and the anthropic principle

- “Multiverse”, as it was firstly introduced in physics as a version of quantum mechanics interpretation, really a rather unphysical phenomenon, at least for the energy reason. Even to create the observed one Matter it was necessary to spend a practically unbelievable portion of energy, to create infinite “number” of Matters in a “multiverse” would need spending an infinitely unbelievable portion. “Anthropic principle” hence has no physical applications, even that would be a rational principle outside physics.

### 5.3. Geometry and topology of external spacetime

- Matter, and the Matter’s spacetime, indeed exist as a part of the spacetime of the absolutely fundamental and absolutely infinite “Information” Set, which – the Set’s spacetime – has at least infinite “number” of space dimensions and, fundamentally one, “true time” dimension. However now humans know almost nothing about the Set’s content and corresponding “external spacetime” besides that it is composed in accordance with the common definitions of the “Logos” elements “Space” and “Time”, more see in the main text.

### 5.4. Origin and fate of the universe.

5.5. What is the origin of spacetime, why is spacetime four-dimensional, and why is time different from space?

- see the main text, section “Cosmology”.

### 5.6. Origin of Lorentz invariance and Einstein gravity

- relating to Lorentz invariance see the main text and [2]. The problem of “Einstein gravity” is really mostly outside physics, though some points in general relativity formalism rather probably could be taken into account at development of the real theory of the fundamental Nature force “Gravity”. See also section 2.9 Mediation of the forces in complex systems

### 5.8. Origin and interpretation of quantum mechanics and quantum fields

- see the main text.

### 5.9. Mathematical consistency

- Matter is a rather simple informational system based on a simple binary reversible logics, and a rather small set of universal fundamental laws/links/constants, and where exchange by information happens as exchange of exclusively true information. Such system is so can be, and so is, effectively described by mathematics, and mathematics is indeed an extremely effective tool. But hardly more than a tool.

### 5.10. Connection between the formalism of physics and the reality of human experience

- see the main text, introductory sections .

## 6. Potential for breakthroughs in techniques and technology

### 6.1. –6.2

- no comments.

## 7. Life

### 7.1. What is life?

- see the main text, section “What is Life”.

### 7.2. How did life on Earth begin – and how did complex life originate?

- see comment to 7.1.

### 7.3. How abundant is life in the universe, and what is the destiny of life?

- to answer the question there is no any reliable information now; and that seems rather possibly isn't too actual.

### 7.4. How does life solve problems of seemingly impossible complexity?

- life does not solve this problem as a critical fundamental task, more see in the main text.

### 7.5. Can we understand and cure the diseases that afflict life?

- that is not a fundamentally irresolvable problem in most cases.

### 7.6. What is consciousness?

- see the main text, sections “Consciousness” and “What is Life”.

## 8. Who will solve the biggest problems?

- see the main text and <https://arxiv.org/abs/0707.4657> v5.