

On an Alternative Concept of Everything and Its Monofundamentalist Quantum Theory

Chernukha V. V., Moscow, Russia

Abstract

The two-level paradigm of the Universe adopted in physics, with different physics for the micro- and macroworld, has proved incapable of interpreting many physical phenomena. Therefore, various attempts have been made to modify it in order to expand its domain of applicability and eliminate its contradictions. The analysis of the paradigm carried out by the author has demonstrated the need for radical changes in conceptions of Everything. The author has undertaken an attempt to develop such a concept of world order that the quantum theory describing it would have no limitations on its domain of applicability, i.e. would operate only with the four constants of the four worlds constituting the cosmos. Four postulates were formulated, the validity of which is confirmed by comparing calculations with numerous instrumental data and certain subjective data.

This article presents these postulates and their empirical substantiation. As examples of the effectiveness of the developed quantum theory of Everything at the micro- and macrolevels, a solution to the problem of the unification of the fundamental interactions is given, together with a high-precision calculation of the masses of fundamental microparticles and the principal parameters of the Sun and its nine planets.

The creation of an alternative paradigm claiming universality and opening up new possibilities for cognising reality requires expert evaluation and discussion by the physical community, the results of which will determine the direction of development of fundamental physics in the foreseeable future.

The references contain mainly the author's publications, where citations are provided to the experimental studies considered by the theory.

Keywords: quantum theory of Everything, monofundamentalist paradigm, worlds of the cosmos, universe, Solar System, fundamental particles and fields, unification of fundamental interactions, living matter.

1. Introduction

In physics, the conception of Everything is based on a two-level paradigm in which micro- and macro-objects are described by quantum and classical physics, respectively, while the cosmos consists of universes. In constructing quantum mechanics, it is assumed that its limiting case is classical mechanics, but the "boundary" between the micro- and macroworlds has not been defined. The conception of the primordial substance that forms the universe is

reduced to the existence of a non-physical object, a spatial singularity possessing the capacity for expansion and for increasing its own volume, this volume being a real quantity. At a certain stage of the expansion of this volume, particles of matter and antimatter are born within it, obeying quantum laws, i.e. the “creation” of mass and energy takes place, although these are absent from the singularity. After the formation of matter is completed, its mass is preserved during the further expansion of space and is gradually structured, forming in such a closed Universe macro-objects that obey the laws of classical physics.

The model of the evolution of the Universe as a result of the “Big Bang” is a cornerstone of the accepted paradigm, which cannot explain a multitude of experimental facts and phenomena anomalous for it, consciousness in particular. Various attempts have been made to expand the domain of applicability of this paradigm, and other pictures of Everything have been proposed (the holographic universe of D. Bohm and K. Pribram, the ether concept, dualistic concepts of the union of matter and Spirit, the many-worlds concept of H. Everett, and others). However, they have not led to a change in the accepted paradigm.

In order to understand whether there are possibilities for constructing a picture of the world more adequate to reality than the accepted one, it is necessary to understand the key problems of the present-day scientific approach.

Physics is based on instrumental data concerning natural phenomena. These data must be confirmed in different laboratories for a phenomenon to be recognised as existing. Thus, physics (1) ignores the subjective method of cognising reality, which existed even before the emergence of science, and (2) limits itself to information about the matter of the Universe with which the available instruments are capable of interacting.

With such an approach, one cannot assume that there are no other worlds in our cosmos with other forms of matter. Esoteric teachings, for example, assert that there exists “subtle-material” matter from which the structure of human consciousness is formed. In the Vedas, this structure has a six-level organisation.

Physics has not developed well-founded conceptions of the space and time of the universe. It is unclear, in particular, how time-reversible particles of matter create atomic matter that is irreversible in time.

It is unknown what symmetry the space of the Universe possesses, in which we observe processes with all four spatial symmetries - translational, axial, central, and spherical. Yet the space of the Universe may possess one symmetry that determines it. Therefore, it may be assumed that there must also exist three other worlds with other symmetries of space, and the processes occurring in them must have mechanisms of manifestation in the universe and in its

objects. Accordingly, the Universe is not a closed physical system, as is assumed in physics today.

Thus, one may assume the existence of cosmos with four successively generated worlds of increasingly complex spatial symmetry, with the world of universes completing the cycle of cosmos formation.

Fragments of the three parent quantum worlds of the universe form the *protostructures* of the objects of the universe and, irrespective of their hierarchical level, endow them with quantum properties. This protostructure of objects, invisible to us, manifests itself in Kirlian photographs as their aura. Thus, the proposed quantum concept of world order is monofundamentalist, i.e. it does not contain the principal contradiction of the accepted two-level paradigm. Matter described by classical physics may be regarded as existing under conditions in which quantum effects are insignificant.

These considerations concerning the four-world structure of the cosmos are confirmed by the monistic cosmology of the ancient Buddhist teaching of Kalachakra, in which four worlds of the “elements” are generated - “wind,” “fire,” “water,” and “earth”. Moreover, the durations of the cycles of the cosmos worlds in this teaching and in the quantum cosmology presented in [1, 2] are close.

The quantum theory of Everything (QTE) will have no limitations on its domain of applicability if it operates only with the four dimensional constants of the four worlds of the cosmos. The creation of such a general theory of Everything requires a choice of its initial postulates adequate to reality.

2. Postulates of the Quantum Theory of Everything

The formulation of the postulates of the monofundamentalist QTE is a problem that has not previously been considered. Its postulates were first published in [3] in 2008. In the author’s subsequent works [2, 4, 5], verification was continued of how accurately the laws of Everything following from these postulates make it possible to describe the available empirical data, both objective and subjective. Particular attention was given to anomalous phenomena that have no explanation, since it was assumed that they contain information about the parent worlds of the Universe. Since firmly established properties and laws of nature had to be taken into account, their broadest possible generalisation was required. It turned out that it was possible to restrict oneself to only four postulates: on the primary substance and the structure of Everything, on the universal mechanism of interaction, on the unified status of the physical quantities generated by it, and on the predetermination of physical processes governed by universal laws.

2.1. The first postulate defines the quantum structure of Everything. Its fundamental quantum state, the null-vacuum, is the primary substance: an infinite absolute space that has

always existed, in which its symmetry and the interaction of matter are absent, while the mean values of all physical quantities are equal to zero. Such a primary substance removes the question of its Creator, who should not figure in science. The null-vacuum is the fundamental quantum state of world order, in each repeated evolutionary cycle of which it successively generates four quantum states, the four worlds of the cosmos with increasingly complex spatial symmetry; that is, in each cycle the null-vacuum acts as the Creator of our Universe (and of universes with other sets of world constants).

First, worlds with translational symmetry of space arise, with scalar particles moving rectilinearly, distinguished by the velocity c of scalar fields (c -worlds). They generate worlds with axial symmetry, in which the scalar particles of the c -worlds acquire rotational motion along quantum orbits and integer spins, the value of which in each world is determined by its own Planck constant (h -worlds). The size of the outer orbit of the resulting bosons increases together with the magnitude of their spin.

Next, the worlds of the physical vacuum (hc -worlds) arise, with central symmetry of space having different Platonic-solid forms that are compatible at the centre (tetrahedron, cube, icosahedron, dodecahedron). In the physical vacuum, bosons generate fermions and particle charges determined by the symmetry of its space and by the constant hc . Particles arise with universal charges that create attraction between them, leading to the formation of material structures [2].

Last, the world of universes arises, with spherical symmetry of space, in which there are no distinguished directions required for the interaction of particles possessing inertial mass and momentum. In the universes, the attraction of massive particles of the physical vacuum is transformed into the gravitational attraction of particles of the universes, which acquire gravitational rather than inertial masses, these generating a spherically symmetric gravitational field.

Unlike the QTE, in the accepted paradigm the Universe and the physical vacuum, regarded as its substance, have a common real space. In the QTE, however, gravitational attraction is absent in the physical vacuum.

2.2. According to the second postulate, any physical quantity generated by the null-vacuum is complex. This is a generalisation of the status of physical quantities, which in present-day physics may be real, imaginary, or complex (for example, the Schrödinger wave function). Real or imaginary physical quantities may occur in particular cases. For example, the space of our universe is real, but universes with imaginary space must also exist.

The complex nature of space sharply increases the number of spatial states (subspaces) differing by at least one coordinate direction. For a complex space of dimension d , this number is equal to $k_d=2^{2^d}$.

2.3. The third postulate defines the universal and nonlocal polarisation mechanism of the formation of complex physical quantities with zero sum, which preserves the mean values of the physical quantities of the worlds of the cosmos at zero. This is a generalisation of the known conservation laws. In [2], it is shown that the dimension of the geometric space in which polarisation processes are realised is $d = 3$. Therefore, the worlds of the cosmos are three-dimensional, and we live in a three-dimensional universe.

The emergence of a real or imaginary physical quantity occurs with zero sum, as in the polarisation of electric charge. The joint formation of real and imaginary scalar or orthogonal vector quantities leads to the emergence of zero complex quantities:

$$\pm a \pm ib = 0; \pm A \pm iB = 0. \quad (2.1)$$

The latter equality is satisfied, for example, by the electromagnetic field $E+iH$ of a light wave ($E^2=H^2$).

The complex nature of space and time in the protostructure of the Universe leads to violation of the accepted conceptions of the homogeneity of space and time, from which the laws of conservation of momentum and energy respectively follow. Their violation observed in certain natural phenomena (for example, in the specific types of destruction produced by ball lightning or tornadoes that still have no explanation) points to the complex nature of the space and time of the protostructure of these objects.

2.4. According to the fourth postulate of the monofundamentalist theory, events at all hierarchical levels are predetermined by universal physical laws, which excludes such concepts as chance or free will. The null-vacuum generates reference events that determine cyclic processes in the cosmos and in its objects. The segments of the evolutionary trajectories of physical structures connecting the reference events are determined by their interactions with the objects and subjects of the worlds of the cosmos.

One of the confirmations of this postulate is the phenomenon of fulfilled predictions. Such reference events as the beginning and end of the First and Second World Wars, the collapse of the USSR, or the Chernobyl disaster were predicted by several clairvoyants. Predictions made for particular individuals or groups of people also come true. Some predictions possess such high precision that chance is excluded. Manifestations of free will have “their own rules,” that is, laws formed at the fundamental level, the level of particles and fields, that is, beyond human understanding.

3. Some Consequences of the Postulates of the QTE

Let us give several examples of an alternative interpretation of the conceptions of the accepted paradigm.

Principle of equivalence. When a particle passes from the physical vacuum into the Universe and back, quasiparticles are generated with the complex mass $\pm m \pm \mathfrak{I}$ determined by (2.1). In this transition, the real component of the quasiparticles annihilates (depolarises) with the inertial mass of the particle of the physical vacuum, and in the Universe the particle has an imaginary gravitational mass. That is, A. Einstein's principle of equivalence, if it is formulated as the equality of the moduli of inertial and gravitational masses, has a polarisation nature. This principle has been confirmed with high precision by laboratory experiments, which also constitutes an empirical confirmation of the polarisation relation (2.1).

Wave-particle dualism. Upon acquiring zero inertial mass in the Universe, a particle becomes a field quantum and acquires interference properties. Therefore, wave-particle dualism is not a natural property of the particle. Its properties depend on the symmetry of the space in which it is localised: in the Universe, a particle can move as part of a wave, but its interaction with other particles occurs in the physical vacuum, leaving a corresponding trace.

On the collapse of the wave function. A multiplet of identical particles passes into the space of the Universe with zero momentum. In the course of momentum polarisation, its particles are generated in pairs and fill all the spatial states of the physical vacuum with different directions of the particle momenta. The independence of the spatial states makes the quantum states of the particles of the multiplet orthogonal and forms a superposition (a pure state), i.e. in the QTE superposition is not regarded as a set of quantum states of a single particle. The interaction of particles of different multiplets occurs in the physical vacuum in their common spatial state. Since a particle of the multiplet with non-zero momentum participates in the interaction, the momentum of the remaining particles of the multiplet likewise becomes non-zero, and the multiplet passes into the physical vacuum. Thus, in the course of interaction, a multiplet of particles in a pure quantum state passes into the space of the physical vacuum, where one of its particles undergoes interaction. Thus, what takes place is an interspatial transition of the multiplet, rather than a collapse of its wave function.

The concept of the collapse of the wave function of particles arose because in the accepted paradigm the physical vacuum is regarded as a substance within the space of the Universe, rather than as another world.

Does a particle have a trajectory? Upon repeated interaction of a multiplet of particles, a different particle of the multiplet, with a different direction of momentum, already participates in it. Therefore, one cannot assume, as the Copenhagen interpretation of quantum mechanics

does, that a particle has no definite direction of motion and no trajectory. The interpretation of quantum mechanics in monofundamentalist theory is deterministic [4].

Why are antiparticles absent in the Universe? The polarisation of complex space and time can occur by two mechanisms: a separate one, as in the three parent worlds of the Universe, and a joint one, as in the case of the polarisation generation of a multiplet of universes. In the first case, worlds with reversible time are generated; in the second, universes with real or imaginary space and with an arrow of time are generated.

As shown in [2], the realisation of rotation in the three-dimensional space of a universe requires the filling of a 16-plet of spatial states characterising the planar complex subspace of the h -world. In the real space of the Universe there are only 8 spatial states, i.e. one more dimension, orthogonal to the spatial ones, is required. It is generated by the propagation of the universal scalar field with velocity c , creating the one-dimensional vector space ct . For the universe, this becomes an independent fourth spatial coordinate, orthogonal to the radius vector r of its three-dimensional space. According to (2.1), the orthogonal vectors r and ct are related by the special theory of relativity relation, which has a polarisation nature:

$$r+ict=0, \text{ i.e. } r^2-(ct)^2=0. \quad (2.2)$$

In [2], it is shown that the polarisation approach makes it possible to obtain the same dependence of time on particle velocity as in the special theory of relativity.

It follows from (2.2) that universes with real (or imaginary) space are generated with different directions of time, i.e. a universe and its anti-universe are located in fragments of a common space separated by a transition zone, but with opposite directions of time. When passing through the transition zone separating them, a particle becomes an antiparticle by means of the polarisation mechanism, and vice versa¹.

The generation of particles and antiparticles in different universes contradicts the Big Bang model, in which the generation of particles and antiparticles in a common space is assumed, where they annihilate. Yet no mechanism for the disappearance of antiparticles from the Universe has been found.

The formation of universes does not violate the law of conservation of mass

¹Robert Monroe, known for out-of-body travel, described in detail in his trilogy his visits to a planet similar to the Earth and inhabited by people whose civilisation was somewhat behind earthly civilisation in its technical development. For these visits, the travelling structure of Monroe's consciousness had to overcome a barrier ("wall"), creating an opening in it. Possibly, he was visiting Anti-Earth in the Anti-Universe, separated from the Universe by a transitional layer in which a change in the sign of time occurred. Since in the QTE the structure of consciousness, detaching itself from the body and travelling, is formed by the bosons of the h -world, and, therefore, can exist with both directions of time, the union of this structure with the structure of consciousness of Monroe's "anti-double", as described by Monroe, is possible [2].

As follows from (2.2), four combinations of space-time are possible, differing in the sign of the radius vector and of time, i.e. universes with real (or imaginary) space are generated in quartets. The sign of mass changes together with the direction of the radius vector, i.e. the masses of pairs of universes generated by the polarisation mechanism are equal to zero.

How does matter of the universes, irreversible in time, arise from elementary particles reversible in time? In the QTE, this occurs when quarks pass from the complex space of the physical vacuum into the real space of the Universe with the formation of nucleons, while neutrons have an unstable hierarchical structure leading to the irreversible decay of atomic nuclei [2].

4. On the Empirical Substantiation of the Postulates of the QTE

For the empirical substantiation of the QTE - a general theory operating only with three dimensional world constants and therefore having no limitations on its domain of applicability - it is sufficient to confirm its postulates [5, Appendix 2].

4.1. The structure of Everything. The empirical substantiation of the first postulate concerning the primary substance and the four worlds of the cosmos is confirmed by data from esotericism, first of all by the monistic cosmology of the ancient Buddhist teaching of Kalachakra, to which modern Buddhism also adheres [1, 2]. The state of blissful repose of consciousness (nirvana) may be associated with the existence of the consciousness structure in the null-vacuum, where interaction is absent. In Kalachakra cosmology, primary is the eternal unlimited space generating four worlds of the “elements” - “wind”, “fire”, “water”, and “earth”, - while the evolutionary processes, as in the QTE, are cyclic, with four different phases, in one of which the cosmos “awaits” a new cycle while abiding in “non-being” (i.e. in the null-vacuum). In Kalachakra cosmology, the durations of the evolutionary cycles have been determined by meditative methods, and they agree satisfactorily with the cycles of quantum cosmology [1].

Another point of agreement with this ancient cosmology is the identical structure of the space of the physical vacuum of the Universe, determined by the mechanism of formation of the spectrum of its fields [2]. These correlations may be regarded as an empirical confirmation, by esoteric data, of the first postulate concerning the quantum structure of Everything.

4.2. The complex nature of physical quantities

The postulate concerning the complex nature of physical quantities is a generalisation of the existing situation regarding the status of physical quantities, which may take real, imaginary, and complex forms. This postulate is substantiated quite fully in the QTE.

1. One of the principal confirmations of the complex nature of the physical quantities of the protostructure of the micro- and macro-objects of the Universe is the high precision in

calculating the measured values of the parameters of the objects studied by using the number of spatial states of complex space $k_d=2^d$.

Very precise results have been obtained in the problems, still unresolved today, of the unification of the fundamental interactions (Section 5.3) and of the formation of the fundamental (truly elementary) particles of the physical vacuum (Section 5.4). One of the principal reasons for these failures is the lack of knowledge of the spectrum of the fields of its complex space, since in the accepted paradigm only the fields of real space are considered.

The “mysterious”, in R. Feynman’s words², fine-structure constant has been calculated in [2, 3] to the ninth (!) digit. In the theory of the formation of fundamental particles by Planck particles [2], whose mass is determined by three measured world constants, the masses of leptons of those generations and those of pions have been calculated to the sixth digit. This is a very high precision of calculation, since the mass of the electron is smaller than the mass of the Planck particle by 22 (!) orders of magnitude. The calculated quark masses agree within the limits of measurement error.

It was shown in [2] that the fundamental particles of the physical vacuum form a hierarchy of particles of the same type, whose hierarchical level is determined by the number of c - and h -world fields localised in their protostructure, with the spin increasing successively by 1. With each new bosonic field in the protostructure of a fundamental particle, its size increases by $e^8 \approx 3000$ times, and its mass decreases by the same factor. This makes it difficult to detect particles of the hierarchical series, given that more massive particles are generated inside less massive ones. Therefore, experimentally, only the most massive particles of the first hierarchical level have been detected. However, the hierarchy of particles plays a determining role in the structuring of the matter of the Universe protostructure (and that of the Solar System) [2]. The existence of a hierarchy of particles is also confirmed in the interpretation of certain experiments and properties of hierarchically unstable particles with a complex hierarchical structure (the neutron, the K-meson [3]).

The masses of nucleons, in whose protostructure, in addition to three quarks, there is a nucleus determining the nucleon mass, composed of two neutral scalar particles of mass 468 MeV (see Section 5.4), have been calculated to the sixth digit [2]. The magnetic moments of the proton and neutron and the size of the proton have been determined with an error of less than one per cent [2, 3]. In [2], the anomalously large decay times of free neutrons and those of

² “Everybody would like to know how this number comes about. Nobody knows. It is one of the greatest damn mysteries of physics: a magic number that is given to us and that man does not understand” (1985).

neutrons in the bound state (ultracold neutrons) were calculated with a percentage error. Today there is no understanding of why neutrons have two such large decay times. In the QTE, this is due to the fact that neutrons are composite, hierarchically unstable particles of the sixth hierarchical level.

In the quantum theory of the Solar System considered in Section 5.5 [2], which, like the Universe, belongs to the tenth hierarchical level, the masses and radii of the Sun and its nine jointly generated planets (including Pluto), the radii of the planetary orbits, the inclinations of the planetary axes to their planes, the periods of rotation of the Sun and the planets, and the angular momentum of the planets have been calculated with an accuracy no worse than one per cent. Such accuracies have not been achieved in classical planetology.

2) Low-energy nuclear transmutations and cold nuclear fusion are possible in matter located in the imaginary subspace of the physical vacuum. In it, the Coulomb interaction of electric charges changes sign, and the Coulomb barrier preventing the fusion of nuclei is replaced by a potential well, i.e. nuclear reactions become possible at any energy of the nuclei. This mechanism made it possible in [4] to interpret the data of the first low-energy reactors of A. Rossi and A. Parkhomov.

3) As shown in [4], in imaginary space the formation of high-temperature superconductivity is possible (with a critical temperature of about 20,000 degrees in the case of a condensate of leptons of the second hierarchical level).

4) Atmospheric phenomena. Thunderclouds can generate lightning every second for a long time, which requires a very effective mechanism for the separation of charges in real space, something hindered by Coulomb's law. But if the protostructure of a cloud has imaginary space, then the separation of charges and the formation of an electric field will occur in it, and this field, penetrating into the cloud, will separate its charges and generate lightning [2].

Aircraft contrails in a clear sky have an intermittent structure, indicating the non-uniformity of the properties of the space of the protostructure of the atmosphere. In the imaginary subspace of the protostructure, the trail creates cloud formations, whereas in its real subspace the ions are neutralised by electrons, and the trail diffuses within 1-2 minutes.

5) The complex space of the protostructure of the Universe is also non-uniform. In its imaginary subspace, low-temperature nuclear reactions occur, with the formation of ever heavier elements. As shown in [4], the abundance of light elements observed in the Universe can be explained by polarisation equilibrium of the particles of its protostructure.

As may be supposed, another manifestation of the imaginary subspace of the protostructure of the Universe, in which photons cannot be generated, is the existence of non-radiating black holes with the reverse direction of time and, therefore, with disappearing

(depolarising) atomic matter [2]. That is, in the QTE, the assumption of the existence of a “non-physical” singularity in a black hole is not required.

In the imaginary subspace of the protostructure of the Universe, where there are no relativistic limitations, the movement of objects at superluminal velocity is possible and, consequently, interstellar flights of spacecraft are possible as well. Therefore, their presence in the Earth’s atmosphere does not contradict the fundamental physical laws of world order. The features of the quantum propulsion system of spacecraft and those of their flights in the atmosphere are examined in [2].

6) According to [1, 2], living intelligent beings are generated in the imaginary subspace of the h -world, and their quantum structures are formed of matter with imaginary mass (in esotericism, these are “subtle-material structures”), with which the existing instruments do not interact. It is assumed that part of the structure of one of the forms of such beings (of the eighth hierarchical level) is transferred by them into the protostructure of the human organism (“incarnates”), making the human being an intelligent and spiritual being. Since the instrumental study of the structures of human consciousness localised in the imaginary space of its protostructure is impossible, then, as shown in [2], for understanding the physics of consciousness, an analysis of the subjective empirical data of esotericism on the basis of the fundamental laws of world order is also necessary.

The human brain realises the interaction of the structure of consciousness located in the protostructure of the human being with the environment surrounding the human being. Therefore, the study of the brain makes it possible to investigate only the corresponding part of the physics of consciousness. In particular, the measured frequencies of the electromagnetic oscillations of the brain and those of the chakras made it possible to calculate the spectrum of the natural frequencies of the six-level structure of human consciousness (as in the Vedas). This spectrum was used in [2] for the physical interpretation of certain manifestations of consciousness, described in the literature but not finding scientific explanation, in the altered and normal state.

4.3. Quantum Effects

Quantum effects in macroscopic bodies have been observed experimentally. An example is the transfer of energy from a cold body to a hotter one, contrary to thermodynamics.

Polarisation-reactive force. One of the most important quantum effects is the formation, by means of the cyclic mechanism of polarisation of massive particles, of a polarisation-reactive force independent of distance [2-5].

As is known, when momentum changes in time, two components of force arise:

$$F = m \frac{dv}{dt} + v \frac{dm}{dt} \quad (4.1)$$

The second term under cyclic polarisation of the mass $m = M e^{i\omega t}$ is the imaginary component of the force, whose magnitude, taking into account the known relation for the energy $M c^2 = \hbar \omega$, is equal to $F_i = i \frac{M^2 c^2}{\hbar} v$.

This quantum long-range action, quadratic in mass and independent of distance, manifests itself both in micro- and in macro-phenomena. Today, in quantum field theory, there is no explanation of the action at a distance characteristic, for example, of EPR pairs, which are generated during the polarisation of momentum and spin. Polarisation-reactive long-range action is a universal force that is a manifestation of the nonlocal polarisation nature of Everything. This force arises when a physical system passes from one quantum state to another, or in order to return a perturbed system to its initial quantum state. For example, when one of the particles of an EPR pair is subjected to a force, the other particle of the pair is instantaneously subjected to the action of the polarisation-reactive force, which preserves the momentum and spin of the pair at zero.

1. The polarisation-reactive force, which satisfies the postulate concerning the complex nature of physical quantities, explains, in particular, the existence of particles rotating in orbits that are not subject to the action of an external force (Section 5.2). Since in this case the force F is equal to zero, the centripetal force is balanced by the polarisation-reactive force F_i , orthogonal to the velocity of rotation. This force explains the phenomenon of confinement and creates the spin-spin interaction of bosons [2].

The polarisation-reactive force orthogonal to the velocity of rotation may be directed along the axis of rotation and used by a rotor to create thrust capable, in particular, of overcoming gravity [2, 3]. As early as the middle of the last century, the English inventor J. Searl created rotating “flying discs” that made flights of hundreds of kilometres. As shown in [3], the propulsive and antigravitational forces of the “flying discs” were due to the polarisation-reactive force. Up to now, no one has succeeded in repeating such flights, although Searl did not conceal the design of these discs or the conditions for their launching.

2. Examples of energy generators operating without fuel are known. According to the mass media, in Switzerland such a generator, “Testatika”, has long been operating in one of the religious communities. The self-accelerating domestic rotary generator of J. Searl, which was studied by researchers who visited him, operated for 30 years and was destroyed when Searl was in prison for the “theft of electricity” from the power grid [3]. It turned out that unrecognised

scientific discoveries can be punishable under criminal law. But today in the USA, one of the fuelless generators (“Earth Engine”) sells the energy it produces.

There is a widespread mistaken opinion that in the ether, there exists in the ether an unlimited quantity of “free energy”, which fuelless generators use. In the QTE, the design of quantum generators is such that it forms the complex space of the physical vacuum of the generator installation in such a way that it polarises its zero energy, and its positive component enters the generator, i.e. the law of energy conservation holds in the generator and in its protostructure. The physics of certain types of fuelless quantum generators is considered in [2 and 4].

Within the framework of the paradigm accepted today, which regards the Universe as a closed physical system, the extraction of excess energy is considered impossible. Therefore, the possibility of the existence of fuelless energy generators is denied by official science.

3. Atmospheric vortices. Today physics cannot answer the question of where large atmospheric vortices (cyclones, tornadoes, and others) obtain their enormous angular momentum and the energy necessary for it. Here, the effect of the self-acceleration of the mass rotation discovered by J. Searl also “operates”; it was experimentally confirmed in [6] and is due to the polarisation-reactive force arising in the protostructure of the atmosphere [2].

In the rotating enormous masses of the upper layers of the Earth’s magma, the emergence of an antigravitational force is possible, and this may be the cause of earthquakes and certain other geological processes [2].

4. In the quantum model of the Universe presented in [2, 4], with superluminal Planck particles continuously generated in the imaginary subspace of its physical vacuum, the polarisation-reactive force plays an important role at all three stages of the evolution of the Universe. At the initial stage, this force decelerates its superluminal expansion to the speed of light. At the subsequent stage, the expansion of the boundaries of the Universe proceeds at the speed of light, and this force participates in the formation of the objects of the large-scale structure of the Universe. Upon completion of the formation of the mass of baryonic matter (at an age of 9.32 billion years), the stage of accelerated expansion of the Universe begins under the action of the radial polarisation-reactive force created by the continuing generation of Planck matter.

In this three-stage quantum model, the age of the Universe is 14.1 billion years, and, according to [2], the formation of stars and galaxies whose age exceeds the age of the Universe (13.8 billion years in its currently accepted *Λ*CDM-model) is possible. This model is based on a number of experimentally unconfirmed hypotheses, including the hypotheses of the existence of non-physical singular points, the expansion of space, and the existence of dark energy of

unknown nature. Within the framework of the Λ CDM-model, it is impossible to explain the existence of early galaxies recently discovered by the James Webb Space Telescope, the oldest of which has an age of 290 million years. In the quantum model of the Universe, the existence of galaxies born before the Big Bang is possible³.

5. Examples of Accurate Calculations of the Parameters of Physical Systems

Below will be given the considered examples of high-precision quantum calculations of the parameters of micro- and macro-objects. In their models, it is sufficient to count the numbers of quantum states of completed polarisation processes determining the parameters of the object of interest to us. This makes it possible to calculate the values of the parameters, taking into account the identical contribution of each quantum state⁴.

It should be noted that in the Universe and in its physical vacuum the multiplets of quantum states are different and are determined by different group properties: in the Universe, by the group $U(N)$, and in complex space, by the group $SU(N)$ with the number of independent matrix elements $N^2 - 1$. Upon transition into the spherically symmetric space of the Universe, one more element is added, compensating the sum of the independent matrix elements. Therefore, the values of physical quantities determined by multiplets of quantum states are different in the Universe and in its physical vacuum⁵.

At the microlevel, two unresolved problems will be considered: the unification of the fundamental particles. At the macrolevel, a model of the formation of the Solar System is

³ According to data from the Canary Islands Institute of Astrophysics (February 2026), the galaxy JADES-1050323, with a redshift of 6.9, was born 100 million years earlier than the Universe. Two other similar galaxies were found among the 31 galaxies studied in this group.

⁴ In the QTE, dynamic effects were not considered, since this requires the construction of a quantum mechanics of real particles, which still remains to be developed. In the author's article "The Monofundamentalist Worldview: Paradigm Derivation of the Schrödinger Equation for Non-Relativistic Free Particles", it is shown that the Schrödinger equation, for the case of the polarisation formation of free particles in the complex space of the physical vacuum, can be derived without invoking classical mechanics as its limiting case, i.e. within the framework of monofundamentalist theory. It is shown that the Schrödinger equation describes functions proportional to the identical density of particles in the real and imaginary subspaces of the physical vacuum, while the product of these functions is proportional to the density of particles in the Universe. This corresponds to the accepted conception that the density of particles in the Universe is proportional to the square of the modulus of the wave function. From the wave equation in complex space, together with the Schrödinger equation, the Klein-Gordon-Fock equation was obtained, describing the polarisation generation of particles in the real subspace of the physical vacuum.

⁵ This explains the existence of the "Hubble stresses": unlike stars, microwave radiation is localized in a physical vacuum [2].

presented. These are three-constant models: the formation of the Universe is initiated by a source of Planck particles located in the imaginary subspace of the physical vacuum, while the sole parameter of the theory for determining the masses of fundamental particles is the Planck mass.

At the microlevel, two unresolved problems will be considered: the unification of the fundamental interactions and the calculation of the masses of fundamental particles. At the macrolevel, a model of the formation of the Solar System is presented. These are three-constant models: the formation of the Universe is initiated by a source of Planck particles located in the imaginary subspace of the physical vacuum, while the sole parameter of the theory for determining the masses of fundamental particles is the Planck mass.

5.1. Fields of the Physical Vacuum and the Universe [2]

In the Polarisation Theory of the Cosmos, the spectrum of the fundamental particles and fields of the physical vacuum is considerably broader than in the Standard Model of elementary particles. This is connected with the central symmetry of the space of the physical vacuum, manifested in the Platonic solids. Today, three vector fields of the real subspace are known, but in the imaginary subspace with dodecahedral symmetry there exist tensor fields with five spin states, generating a quintet of flavour charges and fields unknown today. At the same time, the multiplets of vector and tensor fields carrying interactions between different kinds of particle charges can interact, forming a 72-plet of imaginary combined fields. They play an important role in the formation of material objects of the physical vacuum and of the Universe.

Field of inertia

When a scalar particle with radius $r = \hbar/mc$ is born in the physical vacuum, it acquires a universal charge Q_0 and its self-energy Q_0^2/r , which compensates the particle energy mc^2 . This determines the universal charge of the scalar particle by the relation:

$$Q_0^2 = -\hbar c. \quad (5.1)$$

As shown below, Q_0 is the imaginary charge of the scalar Planck particle, having two signs. In real space, universal charges of the same sign attract each other. One may say that, owing to the universal charge, there is an interaction between inertial masses. Therefore, the scalar field of the physical vacuum may be called the field of inertia.

Combined fields

In the centrally symmetric space of the physical vacuum, the symmetries of the Platonic solids are realised, and these generate multiplets of spatial charges. Their number is determined

by the number of sides (sectors) of the faces of the Platonic solids. The face of the icosahedron generates three colour charges, possessed, in particular, by quarks. The face of the cube generates only two weak charges, since the opposite edges of a square face possess symmetry with respect to the plane passing through the centre of the cube and do not create independent charges, i.e. the charge of one edge coincides with the anticharge of the opposite edge. The face of the dodecahedron generates five complex flavour charges unknown today. The Standard Model does not take them into account. One more complex charge is generated by the centre of symmetry of the Platonic solids, through which their symmetry axes pass. These singlet charges may be called the axial colour and flavour charges. In the electromagnetic charge, the real component is localised in the real subspace and is the electric charge, while the imaginary component, which is the magnetic charge, is located in the imaginary subspace. The singlet charges manifest themselves in the space of the Universe. When the centres of symmetry of the icosahedron and dodecahedron coincide, the quartet and sextet of complex colour and flavour charges, respectively, interact with each other, forming 24-plets of combined charges.

In the complex space of the physical vacuum, there exist bosons with the numbers of spin states localised at the centres and faces of the Platonic solids equal to 1, 3, and 5, i.e. fields with spins 0, 1, and 2. These are the scalar field, the triplet of vector colour fields, and the quintet of tensor flavour fields (their second name, given in [2], is *gravion* fields).

According to (2.1), the orthogonal velocities of rotation and translation of the particles forming the field quantum are equal in magnitude and grow in proportion to the spin of the quantum. Therefore, fields with spin greater than 1 have superluminal velocity and are localised in the imaginary subspace, i.e. it is difficult to register such fields with the available instruments. But a tensor field, together with a scalar field directed towards it, can form a tensor field propagating at the speed of light. This combined tensor field is called the inertion-gravion field. It can interact with a vector colour field, forming fields with spins 1 and 3. A field with spin 3, having 48 spin states, cannot be realised in the physical vacuum (because of the absence of the necessary spatial symmetry) and generates in it two tensor fields, each of which has 24 spin states [3].

Thus, in the physical vacuum, when the quartet of colour fields and the sextet of flavour fields including singlet fields interact, one vector and two tensor 24-plets of combined fields are formed. These fields are imaginary, since $(a+ia)(b+ib)=iab$. They play the determining role in the formation of the spectrum of the fundamental particles of the physical vacuum and participate in the unification of interactions. The structure of the 24-plet of combined fields

includes the 15-plet of colour-flavour fields, containing no axial fields and localised in the physical vacuum, the singlet passing into the space of the Universe and formed by the singlets of the axial colour and flavour fields, and the octet of fields with one axial field.

Gravitational field

It is the singlet tensor field of the spherically symmetric space of the Universe, generated by the singlet inertion-gravion tensor field of the physical vacuum, and it does not participate in the interactions occurring in the physical vacuum. As noted above, the gravitational interaction of a particle arises when it passes into the space of the Universe from the physical vacuum.

The force of gravity is the manifestation in the space of the Universe of the force of attraction of the universal charges of primary particles with inertial mass M_0 and gravitational mass iM_0 . Therefore, the Coulomb attraction of the universal charges of these particles in the real space of the Universe is manifested in the form of Newton's law:

$$F_G = \frac{-G M_0^2}{r^2}.$$

(5.2)

Here the coefficient of proportionality G is the constant of gravitational interaction in the Universe. Taking (5.1) into account, $Q_0^2 = -G M_0^2$, i.e. $M_0 = \pm \sqrt{\hbar c / G}$. This is the mass of the Planck particle, which is the primary particle of the physical vacuum of the Universe and determines, in the QTE, the masses of the fundamental particles generated by it. The gravitational constants of the universes of the cosmos differ, but this does not affect the force of gravitational attraction (5.2).

If one assumes that the universal charges of particles are proportional to their masses, then the pairwise attraction of these charges is transformed in the Universe into Newton's law:

$$F_G = \frac{-G m_1 m_2}{r^2}. \quad (5.3)$$

Since in the QTE space is primary and cannot change its symmetry, gravity in it is not capable of creating the curvature that, in general relativity, effects gravitational interaction.

5.2 Interaction of Particles of the Physical Vacuum [2]

Spin space. In the \hbar -world, charges are not generated, and the interaction of bosons occurs between the spins determining their internal structure, i.e. not in geometric but in spin space [1, 2]. As shown in [2], spin-spin interaction between the spin quantum states of bosons is effected by means of polarisation-reactive action at a distance between similarly or oppositely directed spins. The number of

independent quantum states of a boson with spin l is equal to $4l(l+1)$. The dimension of spin space is defined as the number of 16-plets of spin states of a boson creating rotation in two-dimensional geometric space ($k_2=16$):

$$D = \frac{l(l+1)}{4},$$

i.e. it is proportional to the square of the spin. D takes integer and half-integer values. Two half-integer spin spaces participate in a common vortex process.

A boson with spin 3 localised in spin space with dimension $D=3$, in the imaginary subspace of the physical vacuum forms a tensor field (with $D=3/2$) and three vector fields with $D=1/2$. Therefore, the vector electromagnetic, weak, and colour fields and the tensor flavour fields generated by the field with spin 3 interact. The commonality of origin allows them to be regarded as a unified interaction (and to use the term “unification of interactions”).

Cabibbo and Weinberg angles. The process of generation in the physical vacuum of bosons with spins 1 and 2 occurs on the orbit of the boson quantum with spin 3 during one revolution, i.e. the formed bosons acquire its rotational velocity. Therefore, the square of the velocity of these three bosons is an invariant, whereas the directions of the boson spins are different.

A boson with mass $m = \hbar/rc$, rotating on an orbit of radius r with velocity v , is held by the polarisation-reactive force $F = v dm/dt$.

Since, according to (2.1), the imaginary radial component v_r of the complex velocity of the boson is equal in magnitude to its orbital velocity v_t , the centripetal radial polarisation-reactive force

$$\frac{dm}{dt} v_r = \frac{-dm}{dr} v_t^2 = \frac{\hbar}{c} \frac{v_t^2}{r^2},$$

and it compensates the centrifugal force $\frac{m}{r} v_t^2 = \frac{\hbar}{c} \frac{v_t^2}{r^2}$. Using the value of the

universal charge $Q_0^2 = -\hbar c$, this force may be represented as $Q_0^2 \left(\frac{v_t}{c}\right)^2 \frac{1}{r^2}$, i.e. as the Coulomb attraction

of the q_t -charges formed by the polarisation mechanism and proportional to the rotational velocity, one of which is acquired by the boson, while the other is located at the centre of its orbit. Accordingly, the

boson acquires a charge determined by its rotational velocity: $q_t = i \frac{v_t}{c} \sqrt{\hbar c} = Q_0 \frac{v_t}{c}$.

We have considered the polarisation mechanism of formation, in the physical vacuum, of orbitally rotating particles held in orbit by the polarisation-reactive force.

The boson moves along a helix with translational velocity v_i , creating in each cycle an axial polarisation-reactive force $F_i = \frac{dm}{dt} v_i = \frac{-\hbar}{c} \frac{v_t v_i}{r^2}$. It may be represented as the Coulomb interaction of

the charge of the rotating boson $q_t = Q_0 \frac{v_t}{c}$ with the charge $q_i = Q_0 \frac{v_i}{c}$, located at the centre of the boson

orbit: $F_i = \frac{q_t q_i}{r^2}$.

The spins s of bosons are directed relative to the velocity of the vector field of the physical vacuum at an angle θ_s depending on the magnitude of the spin, which determines the boson rotational velocity v_t proportional to the spin of the boson. Accordingly, at $\theta_s=0$ the rotational velocity of the boson is equal to the velocity c of the vector field. Therefore,

$$\frac{v_t}{c} = \frac{1}{\cos \theta_s} = s,$$

and the translational velocity of the boson v_i is equal to

$$\frac{v_i}{c} = \frac{1}{\sin \theta_s}.$$

It follows that the invariant is

$$\frac{v^2}{c^2} = \frac{v_i^2 + v_t^2}{c^2} = \frac{1}{(\sin \theta_s \cos \theta_s)^2} = \text{Const}.$$

Therefore, when bosons with spins 1 and 2 are formed in the physical vacuum, they will have the same value $\gamma = \sin \theta_s \cos \theta_s$, as the bosons of the vortex h -world with spin 3. Eliminating $\cos \theta_s$, we obtain the relation determining the angle θ_s :

$$\sin \theta_s = \gamma s \quad (s=1; 2; 3). \quad (5.4)$$

The bosons of the h -world are formed with zero complex velocity, i.e. with $\theta_s = \pi/4$, and for $s=3$ we obtain from (5.4) the value $\gamma = \pm \sqrt{\frac{1}{18}}$. For the vector and tensor bosons generated by the boson with $s=3$, we have respectively $\sin \theta_c = \sqrt{\frac{1}{18}} \approx 0.2357$ and $\sin \theta_w = \sqrt{\frac{2}{9}} \approx 0.4714$. These values of the angles correspond, within the measurement error, to the experimental values of the Cabibbo and Weinberg angles respectively, which are parameters of the Standard Model of elementary particles.

The formation of particles of the real and imaginary subspaces occurs in the pair interaction in imaginary space of Planck particles with charge Q_0 . It determines the formation, arising in complex space and proceeding by the polarisation mechanism, of interacting bosons of the real and imaginary subspaces, acquiring velocities respectively u and v_i and charges $q_u = Q_0 \frac{u}{c}$ and $q_i = Q_0 \frac{i|v_i|}{c}$, i.e. $q_u q_i = i \frac{|v_i| u}{c^2} Q_0^2$. Denoting in (2.1) $a \equiv Q_0^2$ and $b \equiv q_u q_i = i Q_0^2$, we obtain that the velocity acquired by the particle being born in the real subspace is equal to

$$u = \frac{c^2}{|v_i|} = c \sin \theta_s. \quad (5.5a)$$

Correspondingly, a particle being born in the real subspace with rest mass m_0 acquires the relativistic mass

$$m = \frac{m_0}{\cos \theta_s} \quad (5.5b)$$

Thus, in the complex space of the physical vacuum, particles of real space are formed with subluminal velocities (5.5a), determined by the polarisation Cabibbo and Weinberg angles. Relation (5.5b) was used in [2–4] in calculating the masses of fundamental particles.

5.3. Hyperunification of Fundamental Interactions [2]

In [2], *hyperunification* is the name given to the theory of the unification of five fundamental interactions generated in spin space by a field with spin 3, four of which - the electromagnetic, weak, colour, and flavour interactions - are localised in the physical vacuum. Their formation and interaction occur in the imaginary subspace and generate, (запятая) in the real subspace, (запятая) singlet vector and tensor fields, which manifest themselves in the Universe as the electric and gravitational fields. As shown above, the interaction of the colour and flavour fields leads to the formation of three 24-plets of combined fields. Two tensor 24-plets are generated by the field with spin 3 and, (запятая) therefore, (запятая) also participate in the unification of interactions.

The unification of interactions may be understood in the sense that the electroweak, colour, and flavour interactions must have the same symmetry group $U(1) \times SU(2)$. The dimension of the complex space of the group is determined by the number of complex charges. Therefore, in the unification of interactions, their three colour fields are divided into a singlet and a doublet. Of the tensor fields, the singlet inertion-gravion field localised in the real subspace (group $U(1)$) participates in the unification of interactions.

Since the initial interaction in the physical vacuum of the Universe is the interaction of the universal charges of primary Planck particles, it is convenient to measure the constants of the charge interactions of its vector and tensor fields in “universal” units $\hbar c$. Since the complex electromagnetic, flavour, colour, and weak fields are formed by the 48-plet of spin states of the field with spin 3 and are generated in an interaction with constant equal to 1, the initial interactions effected by a single charge field have the same constant $1/48$. When the interaction energy decreases, their constants change (in the accepted terminology, they are “running constants”).

Low-energy limit. The interaction constants are determined by the interaction of particle charges in the imaginary subspace, where Planck particles are generated and interact. In the low-energy limit, when the formation of the 72-plet of combined fields is approaching completion, the interaction in the imaginary subspace between pairs of charges of vector and tensor particles leads to the formation of a quartet of combined charges, which have the moduli [2]:

$$q_1 = \frac{e}{\cos \theta_c \cos \theta_w}; q_2 = \frac{e}{\sin \theta_c \cos \theta_w}; q_3 = \frac{e}{\cos \theta_c \sin \theta_w}; q_5 = \frac{e}{\sin \theta_c \sin \theta_w}; \quad (5.6)$$

$$e^{-2} = \sum_i q_i^{-2}; i=1; 2; 3; 5.$$

This quartet of charges includes the doublet of charges of electroweak interaction theory, in which $q_1/q_2 = \tan \theta_c$. This relation is also preserved in the case of the four combined charges.

Let us find the constants α_i of the four combined charge interactions in the low-energy limit. The four fundamental charge interactions are realised in the physical vacuum by three vector fields and one tensor field. Their interaction in the imaginary subspace forms a multiplet of spin states of dimension $3^3 \cdot 5 = 135$ and has the largest interaction constant in the physical vacuum. This is the inertion-gravion interaction, which generates in the Universe the gravitational interaction with constant 1. Since the inertion-gravion interaction is realised in the physical vacuum, $\alpha_5 < 1$.

The fine-structure constant $\alpha = e^2/4\pi\hbar c$ is the constant of electromagnetic interaction in the singlet quantum state of the centrally symmetric space of the physical vacuum. Taking into account (5.6) and the normalisations given below, let us find the relative values of the constants of the fundamental interactions obtained in [2]:

$$\frac{\alpha_1}{\alpha} = \frac{5}{3 \cos^2 \theta_w \cos^2 \theta_c} = \frac{270}{119}; \quad \frac{\alpha_2}{\alpha} = \frac{1}{\sin^2 \theta_w \cos^2 \theta_c} = \frac{81}{17};$$

$$\frac{\alpha_3}{\alpha} = \frac{1}{\cos^2 \theta_w \sin^2 \theta_c} = \frac{162}{7}; \quad \frac{\alpha_5}{\alpha} = \frac{5}{3 \sin^2 \theta_w \sin^2 \theta_c} = 135 \equiv \xi^{-1}. \quad (5.7)$$

The constants α_1 and α_5 determine the interactions of like charges of quanta of vector and tensor fields and have the normalisation $5/3$. This normalisation in (5.7) corresponds to the contribution of the group $SU(2)$ to the singlet state $U(1)$. The first three irreducible representations of the group $SU(2)$ include an unpolarised singlet charge, two imaginary linearly polarised charges, and three nonlinearly polarised complex charges, of which three imaginary components participate in the interaction of like charges. Therefore, five like imaginary charges correspond to the singlet field, which increases the interaction constant by a factor of 5. Of the three real components of the nonlinearly polarised charges, one charge contributes to the singlet state, which reduces the constant by a factor of 3.

Let us give another interpretation of this normalisation. In the constants of like interactions of quanta, α_1 and α_5 , the colour and flavour fields make different contributions. The sextet of flavour fields participates in the unification through the singlet inertion-gravion field, while the other five flavour fields increase the constant of like interactions by a factor of 5. Of the colour fields, one field of the triplet contributes, since the other two have group $SU(2)$. This reduces the constant by a factor of 3 and leads to the equal normalisation $5/3$ of the constants α_1 and α_5 . Let us determine the constant of the singlet inertion-gravion interaction α_5 , which will make it possible to calculate the other four constants in relations (5.7). In the space of the Universe, $\alpha_5 = 1$.

If the dimension of the multiplet of complex quantum states is N , then in the Universe it is described by the group $U(N)$ with the number of matrix states N^2 . In the physical vacuum, the number of independent quantum states is smaller by 1, i.e. the group transition $U(N) \rightarrow SU(N) \times U(1)$ takes place. Since a physical quantity is proportional to the number of quantum states, in the physical vacuum the constant α_5 is reduced by the factor $\beta(N) = 1 - N^{-2}$.

Let us determine the contribution of the tensor combined fields to the interaction constants. In the transformation of the 48-plet of bosonic fields with spin 3 into the 48-plet of combined fields, the total number of spin states increases from 48 to $N_f = 96$. A quantum with spin 3 is localised in the imaginary subspace, where it has 7 imaginary spin states. Of

From the 48-plet of combined tensor fields, two of its singlet fields are localised in the central zones of the space of the physical vacuum and of the Universe, while 46 fields are localised in the physical vacuum. Therefore, the total number of imaginary spin states in the physical vacuum is $N_b = 46 \cdot 7i = 322i$. They change the constant of the inertion-gravion interaction by the factor $\beta(N_b)$.

The two singlet tensor combined fields reduce the constant α_5 more strongly. Of the 135 quantum states, 134 remain in the physical vacuum, i.e. the value of the constant of the inertion-gravion interaction is reduced by one of the singlet combined fields by the factor $(1 - \xi)$, where $\xi = \frac{1}{135}$. Accordingly, the two singlet tensor combined fields reduce the interaction constant by the factor $\mu(\xi) = (1 - \xi)^2$.

The value of the constant α_5 , equal to 1 in the Universe, is determined in the complex space of the physical vacuum by the product of the three factors considered:

$$\alpha_5 = \mu(\xi) \beta(N_f) \beta(N_b) = (1 - \xi)^2 (1 - N_f^{-2}) (1 + |N_b|^{-2}) = 0.98514296.$$

For the constants of the other charge interactions, we obtain:
 $\alpha^{-1} = 137.035992$; $\alpha_1^{-1} = 60.3973446$; $\alpha_2^{-1} = 28.7606403$; $\alpha_3^{-1} = 5.921308296$.

These values of the constants were obtained in [2, 4]⁶. The fine-structure constant α was calculated to the ninth (!) digit relative to the value 137.035999 averaged over different measurements (CODATA data, 2014). Accordingly, the constants $\alpha_{1,2,3,5}$ were calculated with the same accuracy.

The high precision of the calculation of the fine-structure constant means that the Cabibbo and Weinberg angles were also calculated with no lower accuracy, whereas their experimentally found values have errors greater by orders of magnitude.

The Theory of Hyperunification is one of the important confirmations of the initial propositions of the quantum theory of Everything concerning the properties of its physical vacuum.

5.4 Masses of Fundamental Particles of the Physical Vacuum [2]

The problem of calculating the masses of fundamental particles in the Standard Model has not been solved, i.e. the mechanism of the birth of fundamental particles has not been established. It is assumed that particles acquire mass when interacting with the Higgs boson, but the Standard Model does not explain how it itself acquired the value of its mass obtained from experiments. In [2–4], a theory has been developed of the formation of fundamental particles of the physical vacuum by the primary particles of the Universe - Planck particles, whose mass is determined by three world constants. In this theory, the masses of fundamental particles m_k are calculated by the formula obtained in [3]

$$\frac{m_k}{m_{PL}} = e^{-k/2},$$

where m_{PL} is the mass of the Planck particle, and the number of imaginary fields participating in the formation of particles is $k=16(l+1)+n$. Here n is the number of combined fields determining the properties of the fundamental particles of the physical vacuum, while in the brackets of the first term the number of fields of the protostructure of the fundamental particles is given. It includes the scalar field of the c -world and the bosonic fields of the h -world with spins from 1 to l . The value of l also determines the hierarchical level (abbrev. *hierolevel*) of particles of the same type, with the growth of which the mass decreases exponentially, while the size correspondingly increases. The coefficient 16 is determined by the number of spatial states of a two-dimensional complex space of orbitally rotating particles.

The most massive baryons with $l=1$ have been discovered experimentally. Particles of high hierarchical levels play the determining role in the quantum structuring of the baryonic

⁶⁶In [3], instead of $(1+|N_b|^{-2})$, the factor $1/(1-|N_b|^{-2})$ was used. This affects the given values of the constants only in the tenth digit.

matter of the Universe, since within their internal volume there occurs, independently of external perturbations, the formation of multiplets of identical particles of lower hierarchical level and smaller size. In the Standard Model, only the most massive particles (of the first hierolevel) appear, while in quantum mechanics in the point-particle approximation it is impossible to introduce the concept of a hierarchy of particles.

In the physical vacuum, bosons form fermions by means of a mechanism called fermionisation [2]. The outer orbit of the boson is “destroyed” because of the “touching” of the edges of the faces of the Platonic solids, and the spin of the boson decreases by one unit, generating two fermions of the corresponding hierolevel with spins $1/2$. For example, a boson of the sixth hierolevel generates a boson and two fermions of the fifth hierolevel.

The birth of fields in the physical vacuum occurs without the participation of the singlet combined field, i.e. the boundaries of one, two, and three 24-plets of combined fields correspond to the values $n=23, 47, \text{ and } 71$. At $n=71$, particles with the smallest mass - the electron and positron - are born, while at $n=47$ there arise the bosons $Y(47)$, generating the intermediate vector bosons Z and W in the reaction $2m_Y = m_Z + (1-\xi)m_W$, where $\xi=1/135$. In this model, their masses agree with the experimental values with an error of 10^{-4} [4].

Higgs boson. In [4], it is shown that the formation of the scalar Higgs boson occurs when the formation of both 23-plets of tensor combined fields ($n=46$) with zero total spin and charge is completed in the physical vacuum, i.e. a boson is formed with mass $m(46) = m_Y e^{1/2}$ and with the polarisation Weinberg angle θ_w . In the Universe, the formation of this boson occurs with the participation of the singlet inertion-gravion field, increasing its mass by the factor $\frac{1}{1-\xi}$, i.e. the boson acquires the rest mass $\dot{m}(46) = \frac{m(46) \cos \theta_w}{1-\xi} = 125.2 \text{ GeV}/c^2$. This result was published in 2018 [4] and differed noticeably from the experimental values. In 2019 and 2021, measurements were carried out at the LHC by two collaborations, giving respectively the values $(125.35 \pm 0.12) \text{ GeV}/c^2$ and $(125.11 \pm 0.11) \text{ GeV}/c^2$, which confirmed the calculated mass within the experimental error.

This gives grounds to suppose that it was precisely the scalar neutral boson with $\dot{m}(46)$ that was discovered at the LHC. In the QTE it is not the “God particle”, but one of the fundamental particles of the physical vacuum.

Masses of leptons and pions. In [3], a formula was obtained for calculating the masses of leptons and pions:

$$m_0/m_e^0 = N_q \Lambda (e-1)^{s/4} \quad (5.8)$$

Here the model parameter $\Lambda=168+8=176$ is determined by the spin states of the sixth and first hierolevels, while N_q differs from 1 only for the τ -lepton and is equal to 15. The highest spin of the fields participating in the formation of the particle is denoted by s . Its values in the physical vacuum, 0, 1, and 2, determine the masses of the leptons of the three generations, respectively: the electron, the muon, and the τ -lepton. The pion π_0 is formed in the case $s = 3$.

In the model considered in [2, 3], the formation of particles occurs with the Cabibbo angle θ_c for the electron, the τ -lepton, and the neutral pion, while the muon and the charged pion are formed with zero polarisation angle. In this model, three factors are taken into account that distinguish the mass of a particle in the physical vacuum and in the Universe, because the numbers of quantum states in them differ by one unit. The masses of these five particles obtained in this model have an error of less than 10^{-5} [2].

Masses of quarks. They have been measured with low precision, within which the masses calculated in [3, 4] fit. It is shown that the first-generation quarks are formed with angle θ_w (the u -quark) and θ_c (the d -quark), while the second- and third-generation quarks are formed respectively with angles θ_c and θ_w .

On the neutrino and the photon. In contrast to the existing conception that the three generations of neutrinos possess a small mass, in the QTE the rest mass of each of the three neutrinos is equal to zero. This is connected with the fact that the electron has the smallest mass, and the neutrino is a composite particle formed by pairs of particles with zero total mass. Since the neutrino of the Universe has only left-handed rotation, one may assume that the neutrino has right-handed rotation in the imaginary subspace of the physical vacuum.

Let us consider a model in which the neutrino of the three generations is formed by electron-positron pairs of the three generations with zero total mass, the electron being localised in the real subspace of the protostructure of the neutrino, and the positron with negative mass in its imaginary subspace, i.e. the leptons of the neutrino do not interact. Their total angular momentum of rotation is equal to zero, and each particle of such a pair interacts as a fermion with matter having the same sign of mass. Accordingly, the right-handed rotation of the neutrino is realised in the imaginary subspace of the protostructure.

As shown in [2], the three generations of leptons are formed by a field with spin 3, i.e. the leptonic component of the neutrino may have the third hierarchical level. In this model, the rest masses of the neutrino τ -lepton, muon, and electron are equal to 0.68 eV, 0.004 eV, and $3 \cdot 10^{-5}$ eV, respectively. These values of the neutrino masses are close to the values of the neutrino masses obtained in experiments on neutrino oscillation. One cannot also a priori exclude, from

the composition of the neutrino, neutral scalar particles, which do not interact with the baryonic matter of the physical vacuum. Another neutrino model is considered in [4].

One may assume that there also exist other particles with zero mass and charge. Photons are among them, and, like neutrinos, they must be composite particles. In the QTE, the particles of a field quantum at birth have zero complex velocity. Therefore, a photon propagating in the real subspace at the speed of light has an imaginary internal space. There are no relativistic limitations on velocity in it, and there occurs rotation at the speed of light of the forming-the-photon particles with total zero values of mass and charge. One may assume that the photon is formed by an electron with positive mass and a positron with negative mass. When the photon acquires energy, the electron passes to a higher neighbouring orbit, and the photon acquires spin 1. Such a photon, when interacting with atomic matter, does not change its composition and transfers to it its energy.

In this model, the photon cannot move in imaginary space, since in its internal real space the rotation of massive particles at the speed of light is impossible. Accordingly, electromagnetic radiation is impossible in the imaginary subspace of the physical vacuum.

Atomic and dark matter. In the QTE, the scalar matter formed by Planck particles in the physical vacuum is not only dark matter, but also the principal mass of atomic matter, since it forms the nuclei of nucleons [2]. Planck particles with mass M_{PL} , by means of the polarisation mechanism, form the particles of these nuclei of a definite mass. Its magnitude is determined by the number of polarisation states of the quartet of universes. Since in the polarisation of mass two particles are born in each spatial state, $k_3^2 = k_4$ polarisation states are formed in three-dimensional space. Therefore, in the quartet of universes, their number will be $k_4^4 = k_6$. Since the birth of real scalar particles in complex space occurs with polarisation angle $\pi/4$, the mass of one of the two scalar particles forming the nuclei of nucleons is

$$m_0 = M_{PL}/(k_6\sqrt{2}) = 468 \text{ MeV}/c^2.$$

Two such particles participate in the formation of nucleons, and one – in the formation of K-mesons. [3]. Thus, scalar particles form the mass not only of the dark matter, but also of the atomic matter of the Universe.

5.5 Solar System

In [2], the quantum model of the Solar System proposed in [3 and 4] has been developed, which made it possible to determine the principal parameters of the Sun and its nine planets formed together with it. Below is presented the quantum theory of the formation of the Solar System, which made it possible to determine with an error of less than one per cent its principal parameters: the radii of the planetary orbits, the masses and sizes of the planets and those of the Sun, the periods of their proper rotation, and a number of other parameters.

In the quantum model, the Solar System (like the Universe) has the tenth hierarchical level, which indicates an early beginning of the formation of its protostructure. Its planetary system has the ninth, while the Sun and the planets have the eighth hierolevel.

The ten radial layers of the Solar System are realised by the localisation in them of two quintets of flavour charges, dividing each belt into equal-thickness “charge” layers, in each of which one of the 10 bodies of the Solar System is born.

Three 24-plets of combined fields participate in the formation of the fermionic matter of the Solar System. In the formation of its ninth hierarchical level, the protostructure of the planetary system is formed, which first, with the participation of two 24-plets of tensor fields, generates the outer planetary belt, and then, with the participation of the 23-plet of vector fields, the inner planetary belt. Taking into account the two spin states of fermions, the outer belt has 96, and the inner belt 46 quantum states, which, in each belt, form a system of concentrically arranged layers of equal thickness. In some of them planets are born.

Thus, the planetary system is formed by combined fields, while the quintets of flavour charges divide each of the two planetary belts into five layers of equal width.

At the centre of the planetary system, one of the two singlet tensor combined fields participating in the formation of the Sun is localised, while the second singlet field and Jupiter, formed together with it, are localised near the boundary of the belts.

After the birth of the Sun-Jupiter pair, Saturn is formed first, and then the Uranus-Neptune pair, which subsequently separates. At the final stage, the solid-body planets and moons are born.

In the model under consideration, the planetary system of the ninth hierolevel is born by a field with spin 9 and forms a protostructure of 9 layers with fields of spins from 1 to 9, while each of the 9 layers of the protostructure is divided into three sublayers with three differently coloured quarks of the ninth hierolevel q_9 , whose radius we denote by R_1 . The central zone is the real space forming the Sun, in which the formation of the three-orbital proton of the ninth hierolevel p_9 takes place.

It is assumed that the quarks q_9 rotate in orbits, the distance between which is equal to the radius of the quark R_1 , i.e. the thickness of the three layers is $3R_1$. Accordingly, the radius of the proton of the ninth hierolevel is equal to $3R_1$, while the radius of the entire planetary system is

$$R_2 = 27 R_1$$

It is also assumed that the Sun and the planets of the first belt are formed inside the quark q_9 of radius R_1 located at the centre, while, at the very centre of the planetary system, a proton of the eighth hierolevel is localised, inside which the Sun is born.

Inside the centrally located proton p_9 , Jupiter is born together with the Sun, and it may be regarded as the central body of the giant planets, determining their parameters. For Jupiter and the four planets of the first belt, such a central body is the Sun.

When the quark q_9 is formed as part of the 27-layer protostructure of the Solar System, its dimensions change. In joint birth, the number of complex layers is equal to $\Omega(27)=27^2-1$, whereas in separate formation, i.e. in the case of a free quark, $\Omega(26) \times 1$. The size of the quark per one layer of the quantum system does not depend on the mode of formation. Therefore, in the Solar System the radius of the quark q_9 is equal to:

$$R_1 = \frac{\Omega(27)}{\Omega(26)} R(9) = 272.86 \text{ million km},$$

where $R(9)$ is the radius of a free quark of the ninth hierolevel, the calculated value of which, obtained in [3]⁷, is equal to $2.53 \cdot 10^{13} \text{ cm}$.

The planetary system is an example of the formation of a five-layer rotating structure arising in the polarisation of five radial flavour charges in them. One of the quintets of its layers is located inside, and the other - outside R_1 . The radii of the layer boundaries of the first and second planetary belts are equal respectively to

$$Z_{1b} = \frac{R_1}{5} b \text{ and } Z_{2b} = \frac{27 R_1}{5} b, \text{ where } b=1, 2, 3, 4, 5.$$

$$R_{1b} = \frac{R_1}{5} \left(b + \frac{s_i}{46} \right); b=1, 2, 3, 4; s_i = \pm 1, 2, 3 \dots 23. \quad (5.9)$$

$$R_{2b} = \frac{R_1}{5} \left(b + \frac{s_i}{96} \right); b=1, 2, 3, 4; s_i = \pm 1, 2, 3 \dots 23 \quad (5.10)$$

The localisation of combined fields occurs layer by layer, each field being located in tolayers with different directions of the polarisation processes. In one of the localisation layers, the field is formed, while in the other it depolarises. Accordingly, in the first belt, the 23-plet of vector combined fields forms 46 layers, and in the second belt, the two 24-plets of tensor fields

⁷ The radius of the quark of the ninth hierarchical level R_9 , which serves as a parameter of the model, makes it possible to determine with sufficient accuracy the radii of the planetary orbits (Table 1). Its value in [3] was calculated under the assumption that the formation of the three-quark shell of the proton occurs by means of two triplets of tensor colour-flavour fields, and that the sizes of the quark and the proton are proportional to the time of their formation. In this model $R_9 = (e^6 - 1)^{1/2} R_9(p)$.

form 96 layers. The possible orbital radii of the planets formed in the first and second belts are determined respectively by the relations [3]:

Here the value of s_i determines the quantum orbit of the planet formed in one of the layers. When a pair of bodies is born, the more massive body is displaced inward from the boundary of the belt, acquiring a negative value of s_i .

The values of s_i of the solid-body planets of the first belt are determined by the multiplets participating in the formation of the planets, which form the 24-plet of vector combined fields. Therefore, for the solid-body planets of the first belt, we obtain:

$$\sum_i |s_i| = 24.$$

In the model under consideration, at the first stage of the formation of the solid-body planets, the protostructure of the most massive planet - the Earth - separates from the protostructure of the other three planets of the first belt. This occurs through the division of the 24-plet of vector combined fields into two 12-plets, one of which determines the radius of the Earth's orbit, and the other - the radii of the orbits of the other three solid-body planets. At the next stage, the protostructure of Venus, with a singlet combined field, separates, which imparts special properties to it, and then Mercury, with a triplet of colour-charge fields, and Mars, with $s_{Ma} = 8$, i.e. one cannot exclude that the formation of its orbit is determined by combined fields whose component is the axial colour and flavour fields.

It is assumed that the singlet, triplet, and quintet of fields participating in the formation of planetary orbits contain an axial field and have a polarisation origin, i.e. the quantum numbers of the planetary orbits $s_i = \pm 1, \pm 3$, and ± 5 are realised. Therefore, for the planets of the second belt, $s_i = 1, -3$, and ± 5 . Saturn, the closest to Jupiter, forms a polarisation pair with Mercury, the closest to the Sun, i.e. $s_{Sa} = -3$. The second pair is Venus and Pluto, which acquires the value $s_{Pu} = 1$. The third pair of planets is located in the second belt: since Uranus is closer to the Sun, $s_U = -5$ and $s_{Np} = 5$.

These quantum numbers of the planetary orbits and relations (5.9) and (5.10) are used in Table 1 to determine their orbital radii and give good agreement with the astronomical data. This is a confirmation of the model under consideration.

The jointly formed particles of the Sun and Jupiter acquire rotational velocities under the action of complex flavour fields forming a 30-plet of imaginary fields - a singlet, five linearly polarised, and 24 nonlinearly polarised fields. It is formed by the 30-plet of peripheral ("edge") quantum states of the icosahedron or dodecahedron. These 30-plets participate in the formation of the Sun and Jupiter, but the centrally located Sun has an additional spatial state.

Planets	b	s_i	R_b million km	$\langle R \rangle$ million km	$\frac{R_b - \langle R \rangle}{\langle R \rangle}$ %
Mercury	1	3	58.1	57.9	0,35
Venus	2	-1	108.0	108.2	-0,18
Earth	3	-1 2	149.5	149.6	-0,067
Mars	4	8	227.8	227.9	-0,044
Pluto	4	1	5909	5910	-0,017
Saturn	1	-3	1427	1427	0
Uranus	2	-5	2870	2870	0
Neptune	3	5	4497	4497	0

Table 1. Calculated values of the mean radii of the quantum orbits of the eight planets of the Solar System [3].

Since in each quantum state of the 30-plet a particle of Jupiter acquires a rotational state, the total number of quantum states of Jupiter's particles is 30^2 . For the Sun, taking into account its singlet central quantum state, the number of quantum states of the particles is equal to 31^2 . Since their rotational velocities are proportional to the number of quantum states, the ratio of their velocities is equal to:

$$v_{Jup}/v_{\odot} = (30/31)^2.$$

From the equality of the angular momenta of the Sun and Jupiter formed together, we obtain the relation between the radius of Jupiter's orbit R_{Jup} and the radius of the Sun R_{\odot} :

$$\frac{R_{Jup}}{R_{\odot}} = i \left(\frac{31}{30} \right)^2 \frac{M_{\odot}}{M_{Jup}} \quad (5.11)$$

This relation is satisfied with an accuracy of 0.06%. The parameters entering into this relation will be calculated below.

The value of Jupiter's orbital radius absent from Table 5.1 is found from relations (5.10) and (5.11).

In [3], it is shown that the radius of the Sun is determined by the radius of the proton of the eighth hierolevel $R(p_{(8)})$ and is equal to:

$$R_{\odot} = (31/30) R(p_{(8)})/(e^2-1)^{1/2} = 696 \text{ thousand km.}$$

This value agrees with the measured equatorial radius of the Sun.

5.5.1 Masses of the Ten Principal Bodies of the Solar System

As in the case of the formation of fundamental particles, the sequence of the birth of the bodies of the Solar System is determined by the number of combined fields formed in it. With each new field, the masses of the bodies being formed decrease. As shown in [3], the time of formation of an n -plet of fields is equal to $t_n / \tau = (e^{2n} - 1)^{1/2}$ where $\tau = \hbar/(m_{pL}c^2)$ is the time of

formation of a scalar Planck particle with mass m_{PL} . Therefore, the masses of the bodies decrease exponentially with increasing n .

The sextet of flavour fields participates in the formation of the Uranus-Neptune pair ($n_{U-Np}=3$), while the quartet of colour fields participates in the formation of the Sun-Jupiter pair ($n_{\odot-Jup}=2$). The birth of the solid-body planets occurs when these multiplets form the 24-plet of vector combined fields ($n_1=12$).

Mass of the Sun. In [7], for determining the equilibrium mass of the Solar System, the formula is obtained:

$$\dot{M}_{\odot} = \frac{2\chi^2 k_7 m_{PL}}{(e^4 - 1)^{1/2}} \quad (5.12)$$

As shown in [2], the polarisation space of the protostructure of the Solar System is seven-dimensional, i.e. the number of quantum states of its particles is k_7 . The coefficient 2 in (5.12) takes into account the increase in the number of quantum states under the polarisation of time.

The parameter χ takes into account the fact that the primary matter of the Solar System is, in the physical vacuum, in a bound state and determines the corresponding mass defect [7]:

$$\chi = (1 + |N|^{-2})(1 - \xi)$$

where the number of imaginary combined fields of the physical vacuum is $N = 23i$, while ξ is the coefficient taking into account the reduction, equal to 1/135, of the constant of the inertion-gravition interaction.

It follows from (5.12) that $\dot{M}_{\odot} = 2.0011 \cdot 10^{33}$ g. Since the measured mass of the Sun, $1.98892(25) \cdot 10^{33}$ g, is smaller by only 0.6%, the Sun may be regarded as a star in a state close to polarisation equilibrium.

For two centuries, the problem of the distribution of angular momentum in the Solar System has remained unsolved: 98% of it is accounted for by a thousandth fraction of the mass. In [3, 7], this problem was considered within the framework of a quantum polarisation model, in which it was taken into account the fact that, in the rotating protostructure of the Solar System, its Planck particles have the same number of spatial and rotational quantum states. Therefore, the total number of vortex quantum states of the Solar System is equal to $k_7^2 = k_8$, and its calculated angular momentum exceeds the measured orbital angular momentum of the nine planets by only 2.5%. This small difference is accounted for by mainly on the proper angular momentum of the Sun.

Planets of the first belt. The masses of the planets of the first and second belts are proportional to the number of combined fields of the physical vacuum forming them and are determined by the masses of their largest planets, the Earth and Jupiter, respectively.

As shown in [3], the masses of the Earth, Venus, Mars, and Mercury are formed by 92-, 75-, 10-, and 5-plets of combined fields, respectively. The Earth is the only planet whose mass is formed by four 23-plets of fields. One 23-plet of the *transitional world* of the physical vacuum, considered in [2], realises the interaction between bosons and fermions, while three 23-plets of the combined fields of its *fermionic world* form the objects of the Universe [2]. The singlet quantum number of the orbit of Venus supplements each of the three 23-plets of the fermionic world to a 24-plet, while three more of its fields are boson-fermion fields.

A 15-plet of vector combined fields participates in the formation of the Mercury-Mars pair. Upon their separation, Mercury receives one of its three quintets of fields, and Mars the other two.

It follows that the mass of the planets of the inner belt is equal to

$$M_1 = 91/46 M_E. \quad (5.13)$$

It is determined by the mass of the Sun. The ratio of this mass to the mass of the Sun obtained in [3] is

$$M_1 = 30/31 \cdot M_\odot / (e^{24} - 1)^{1/2} \quad (5.14)$$

and is satisfied with an accuracy of 0.03%. Relations (5.13) and (5.14) determine M_E/M_\odot .

Planets of the second belt. As shown in Section 5.5.3, unlike Uranus, one combined field with an axial flavour component participates in the formation of the inclination of Neptune's planetary axis, i.e. a sextet of combined fields participates in the formation of Neptune. The masses corresponding to one “orbital” quantum state of the three giant planets satisfy the polarisation relation:

$$\frac{M_U + M_{Np}}{s_{U+Np}} + \frac{M_{Sa}}{s_{Sa}} = 0. \quad (5.15)$$

When the Uranus-Neptune pair is formed, the latter acquires an additional quantum state determining the axis of inclination of its axis to the orbital plane. Therefore, the analogous relation for the masses of these planets has the form:

$$\frac{M_U}{s_U} + \frac{M_{Np}}{s_{Np} + 1} = 0; \quad (5.16)$$

Relations (5.15) and (5.16) are satisfied with an accuracy of 0.2% and 0.3%, respectively.

According to [3], the relation

$$M_U + M_{Np} / 2 = M_{Jup} / (e^6 - 1)^{1/2} \quad (5.17)$$

holds, being satisfied with an accuracy of 0.2%.

Relations (5.15)-(5.17) determine the ratios of the masses of the three giant planets to the mass of Jupiter. In total, the mass of all four giant planets is equal to $1.4M_{Jup}$.

The value of Pluto's mass obtained in [3],

$$M_{Pu} = \frac{M_{Jup}}{(e^{24} - 1)^{1/2}} = 0,0023 M_E$$

was not taken into account in determining the mass of Jupiter.

Relations (5.13)-(5.17) make it possible to calculate, with an accuracy better than one per cent, the relative masses of Jupiter, Saturn, Neptune, and Uranus [2]. Since relations (5.8)-(5.14) determine the masses of the Sun and the Earth, the quantum model under consideration makes it possible to calculate the masses of all nine planets of the Solar System.

Thus, the considered quantum model of the formation of the ten principal bodies of the Solar System determines, with an accuracy better than 1%, the presently existing orbital radii and masses of its nine planets, which are born together with the Sun and form with it a common quantum system. This means that during the existence of the Solar System these parameters did not change substantially, i.e. they are equilibrium ones, and there exist polarisation mechanisms for their preservation.

5.5.2. Sizes of the Sun and the planets

The size of cosmological objects of the Universe is determined by their protostructure, and their structure by the process of its formation.

The tenth hierolevel of the protostructure of the Solar System allows one to assume that the process of its formation by Planck particles occurred during all nine stages of the formation of the large-scale structure of the Universe, i.e. 9.32 billion years. Its tenth stage began with the formation of the planetary protostructure, and then, with the beginning of the generation of nucleon matter, the Sun and its nine planets were formed. Thus, it is assumed that the formation of the Sun occurred in 10 stages, and that of the planets during one stage.

In this model, the protostructure of the Sun is formed by ten layers of equal thickness, in each of which three sextets of combined fields of the worlds of "prenucleon" matter are localised [2]. Nucleon matter is born upon completion of the formation of the vector fermion-fermion 24-plet of combined fields. In each of the ten layers of the Sun, 18 fields (three sextets) of pre-nucleon matter generate 18 vector fields of nucleon matter.

Since Jupiter was born together with the Sun, 18 fields of pre-nucleon matter are also localised in the protostructure of Jupiter, three of which, with the axial flavour field, create its proper rotation. Three quintets of fields participate in the formation of the protostructure of the

giant planets born after Jupiter: for Saturn, all three quintets, and for the Uranus-Neptune pair, two quintets, one for each of them.

Upon completion of the formation of the 24-plet of vector combined fields, the birth of nucleon matter begins for the giant planets and the planets of the first belt.

The proper rotation of the planets themselves arises when their nucleon matter is born, with the number of their fields exceeding the number of the fields of *prenucleon* matter [2]. One may assume that Jupiter, as the most massive planet, is formed by the greatest number of nucleon-matter fields - the 23-plet of combined fields of the physical vacuum.

When objects are born in the four-dimensional space-time of the Universe, a 24-plet of space-time states of the objects of the Universe is realized, from the 256 spatial states of the fermionic world of the physical vacuum. Accordingly, the thickness of the radially arranged layers of nucleon matter is reduced by a factor of 16 compared with the thickness of the layers of pre-nucleon matter. In each of the layers of the Sun and the planets, one vector combined field is localised.

If the numbers of fields of pre-nucleon and nucleon matter of their protostructure are denoted respectively by N_1 and N_2 , then the radii of these bodies will be determined by the relation

$$R = l(16N_1 + N_2)h_f. \quad (5.18)$$

Here l is the number of layers of the object, while h_f is the thickness of a layer of the quantum structure of objects of the Solar System of the eighth hierarchical level, determined in [2] and equal to 227.5 km⁸.

For the values of N_1 and N_2 obtained in [2], the planetary radii calculated by formula (5.18) have the percentage errors given in parentheses: Jupiter (0.1), Saturn (0.01), Uranus (0.2), Neptune (0.2), Venus (-0.4), Mars (0.65), Mercury (-2.1).

5.5.3 Rotation of the Planets and the Sun about Their Axis

Rotation of the planets. The proper rotation of a planet arises in one of its quantum states and is determined by the frequency of formation of Planck particles in the planetary system. At the first hierarchical level, the frequency of formation of Planck particles ω_p , whose mass is denoted by m_{pL} , is equal to:

$$\omega_p = \frac{c^3}{G m_{pL}}.$$

⁸⁸Since the radius of the Sun given in (5.5) is determined by world constants, the thickness of the quantum layer is not an additional dimensional empirical constant of the QTE.

In rotating matter, it determines the frequency of its rotation, since the birth of particles occurs on each revolution at the same point of the orbit. At each hierarchical level of the planetary system, Planck particles are formed in the physical vacuum in πk_4 -plets. With each decrease of the hierarchical level, the mass being born increases by a factor of πk_4 , while the frequency of the birth of particles decreases by the same factor. Therefore, the period of birth of the rotating matter of the planetary system, which has nine hierarchical levels, increases by a factor of $(\pi k_4)^9$ and is determined by the relation obtained in [3]:

$$T_9 = 2\pi \frac{(\pi k_4)^9 G m_{PL}}{c^3} = \dot{\iota} 2.5945 \text{ days} \quad (5.19)$$

This is the characteristic time scale of the proper rotation of the planets.

Since the formation of the fields of a planet occurs successively, its period of rotation is proportional to the number of fields of the planet N participating in the rotation of its matter, and to the probability of realisation of the axial fields of the planet.

In the model considered in [2], the periods of rotation of the planets were calculated with the percentage errors indicated in parentheses: Mercury (−0.57), Venus (−0.03), Earth (0.05), Mars (0), Jupiter (−0.05), Saturn (−0.1), Uranus (0), Neptune (0), and Pluto (0.05). From this it follows that the observed rotation of the planets is an equilibrium one and did not change appreciably during the existence of the planets. In classical planetary cosmogony, where the planets are formed by the aggregation of small fragments of matter, the situation is different: the rotational velocity of the planets changes in the course of their evolution.

5.5.4 Radiation of the Sun

In the quantum model of the evolution of the Universe, the fundamental process is the continuous birth of Planck particles. Stationary stellar objects arise when the process of the formation of matter in the protostructure of the star compensates for the burning-out of its mass.

According to Section 4.3, one quantum state of the Solar System corresponds to the mass $m = 2\chi^2 m_{PL}$, where $m_{PL} = \frac{\hbar}{c^2 \tau_{PL}}$ is the Planck, τ_{PL} is the time of formation of a Planck particle, and $\chi = (1 + |N|^{-2})(1 - \xi)$. Quasiparticles with time of birth τ and mass $m = \frac{\hbar}{c^2 \tau}$ rotating together with the matter of the Sun, are formed in multiplets generated by quintets of inertion-gravition fields. Since each of the five fields generates πk_4 -plets of quasiparticles, the rate of formation of mass decreases by a factor of $(\pi k_4)^5$. Accordingly, the rate of formation of the matter of the Sun, taking into account $\frac{m_{PL}}{\tau_{PL}} = \frac{c^3}{G}$, is equal to:

$$\frac{dM_{\odot}}{dt} = \frac{1}{(\pi k_4)^5} \frac{dm}{d\tau} = \left(\frac{m}{m_{PL}} \right)^2 \frac{c^3}{(\pi k_4)^5 G} = \frac{4 \chi^4 c^3}{(\pi k_4)^5 G}.$$

If one does not take into account the emission of solar particles and assumes that the entire decrease in the mass of the Sun occurs as a result of thermonuclear burning, then the power of the electromagnetic radiation generated by the Sun will be:

$$W_{\odot} = c^2 \frac{dM_{\odot}}{dt} = 3.86 \cdot 10^{26} \text{ W}.$$

This result was obtained in [7]. Various measurements of the electromagnetic radiation of the Sun reaching the Earth give the value of its power in the range $(3.84 \div 3.86) \cdot 10^{26} \text{ W}$.

The quantum model of the equilibrium Sun makes it possible to resolve the so-called “faint young Sun paradox” in the modern theory of stellar evolution. In that theory, the young Sun should radiate a power one-third less than at the present time. During that period, our planet should have been covered with snow and ice, and, consequently, early forms of life (anaerobic bacteria) could not have appeared. At the same time, the available palaeontological data testify to a warm climate during that period of the Earth’s evolution.

Like the Sun, its planets should also be in a state of polarisation equilibrium. Therefore, by polarisation mechanisms both the mass and the rate of the proper rotation of the planets are maintained in equilibrium, although in present-day planetary cosmogony the latter is considered to be a quantity that changes substantially. The polarisation mechanism compensating for losses of matter and energy should also manifest itself on the planets, maintaining their quasistationary quantum state. In Jupiter, Saturn, and Neptune, the intrinsic heat release exceeds the absorption of solar radiation. One of the possible mechanisms of planetary heat release is low-temperature nuclear and chemical reactions proceeding in the imaginary subspace of their protostructure. On the planets they, as in the Universe, can create chemical elements. This is also a possible mechanism of the observed formation of hydrogen and helium on the Earth.

5.5.5 On the Inclinations of the Planetary Axes to the Plane of Their Orbits

Let us consider a model in which the angles of inclination of the planetary axes to the orbital plane are determined by the polarisation mechanism of changing the phase of the wave functions of the planets and by the 23-plet of vector combined fields of the physical vacuum. The nine planets are divided into three groups, each of which contains three planets and different mechanisms for the emergence of the inclinations of the planetary axes.

It is assumed that, in the first group, one combined field participates in the formation of the inclination of the planetary axes, whose component is the axial colour field; in the second group, three such fields participate; and in the third group, the remaining 19 combined fields of the 23-plet participate.

In the first group, the formation of the wave functions of the planets is determined by linear polarisation, i.e. by the formation of two wave functions differing only in sign and in the corresponding phase values: 0° and 180° . This group includes Mercury (0.01°), as well as the pair Jupiter (3.13°) and Venus (177.36°), the sum of the angles of inclination of the axes of which exceeds the phase 180° by only half a degree.

In the second group of planets, three fields of this same quintet participate, while the change in the value of the wave function is determined by the polarisation mechanism (2.1) with the complex multiplier $\sqrt{1/2}(-1+i)$. The corresponding change in the phase of the wave function is 135° . Thus, the phase change corresponding to one combined field of the quintet is 27° . This phase value determines the mean value of the inclination of the planetary axes. The three planets of the second group have one field each, and they acquire inclinations of their axes close to the phase value 27° . These are Saturn (26.73°), Neptune (28.32°), and Mars (25.19°), with a mean axis inclination angle of 26.75° .

The third group includes the Earth, Uranus, and Pluto, with axis inclination angles of 23.45° , 97.77° , and 119.61° , respectively. In the formation of their inclination angles, 19 fields of the 23-plet participate: three quintets of fields localised in the physical vacuum, three fields with an axial flavour field, and one field with an axial colour field. These fields are divided into two groups: two quintets determining the inclination angles of the individual planets, and 9 fields determining the sum of their angles. Therefore, one field of the nonet corresponds to an inclination angle of 26.76° , practically coinciding with the mean value of the angle of inclination of the axes of the planets of the second group.

One field of the two quintets of fields corresponds to a mean axis inclination angle of 24.08° . It follows from this that, in the formation of the inclinations of the axes of the Earth, Uranus, and Pluto, one, four, and five vector colour-flavour fields of the 23-plet participate, respectively. Since the 15-plet of combined fields is localised only in the physical vacuum of the planets and does not influence their properties in the Universe, for the three quintets, the phase that does not change the value of the wave function of the planets is equal to 360° , i.e. one of

their fields corresponds to the phase $360/15=24^\circ$. It determines the mean inclination angle of the axes of the planets of the third group, 24.08° , corresponding to one field.

The agreement, obtained with an error not exceeding one per cent, between the polarisation model of the formation of the angles of inclination of the planetary axes to the orbital plane and the astronomical data reveals, in this process, the determining role of the polarisation mechanisms changing the phases of the wave functions of the planets, and of the 23-plet of vector combined fields of the physical vacuum of the protostructure of the Solar System.

In [2], quantum models of magnetic fields and vortex processes in the atmospheres of the planets are also considered, including the mysterious periodic appearance, (запятая) at Saturn's north pole of a rotating atmospheric structure in the form of a regular hexagon, as well as the stable system located at Jupiter's South Pole consisting of six powerful vortices, one of which is in the centre and five - around it.

Moons of the planets. The number of moons of the nine planets, equal to 61, is determined by the symmetry of the space of the physical vacuum of the Solar System: by the number of edges of the icosahedron and dodecahedron and by their common centre⁹. Solid-body moons must be born around the four large planets of the second belt by quintets and sextets of combined fields of the physical vacuum: three sextets each for Jupiter and Saturn, three quintets for Uranus, and two quintets for Neptune. According to [3], for Jupiter and Neptune the two lowest moon orbits are not realised, since they are located within the volume of these planets. Therefore, the formation of two pairs of moons occurs around neighbouring solid-body planets.

The planet nearest to Jupiter, Mars, receives from it two "extra" moons. Both moons of Neptune are formed later around the nearest planets lacking moons - the Earth and Pluto. In this oppositely directed "transfer" of Neptune's moons, they are born (unlike the moons of Mars) in different planetary belts, and therefore the frequencies of the proper and orbital rotation of the Moon and Charon are formed independently of one another by the polarisation mechanism with zero sum of these frequencies. Therefore, these moons have a side facing the planet.

6. Discussion

⁹In the QTE, this same symmetry of the space of the physical vacuum forms, in the universal genetic code, a 61-plet of functional codons and 20 amino acids formed by them [2].

The analysis of the problems in the accepted two-level paradigm and in the methodology of empirical research has shown the reasons for the limitations of the existing conception of Everything and of the approach to the cognition of reality. It has become clear that the picture of the world must be changed radically, moreover with due regard to the data of the subjective methods of cognising reality that do not contradict the physical laws of Everything. The author of the article set himself what seemed to be an unrealizable task: the development of a monofundamentalist quantum concept of Everything claiming universality of the description of reality.

Four postulates of the paradigm of Everything were formulated, and the foundations of its general quantum theory were developed, operating only with the constants of the four worlds of the cosmos with different spatial symmetry. Three of its quantum worlds form the Universe and its objects of different hierarchical levels with a protostructure not taken into account today, which endows them with quantum properties. This makes the QTE a monofundamentalist theory. For its substantiation, quantum polarisation models of manifestations of inert and living matter differing in their physical nature and hierarchical level were constructed. Moreover, these models agree with empirical data.

Particular attention in the construction of the QTE was paid to the principal unresolved problems of the accepted physical paradigm and to the phenomena unexplained by it. Among the most important is consciousness. In the QTE, human consciousness is regarded as a phenomenon of the vortex h -world, inherent in hierarchical structures of bosons with imaginary mass. This made it possible, in particular, to give a physical interpretation to a number of manifestations of consciousness in the normal and altered states. The development of this theory of consciousness opens the possibility for quantum physics to become the foundation of the humanities as well.

As in the formation of the spectrum of fundamental particles, the combined fields of the physical vacuum unknown today also play the determining role in the formation of terrestrial structures of living matter. In [4], it was shown that in the Phanerozoic the change in the spectrum of the Earth's combined fields determines the evolution of terrestrial life with its epochs of global extinction, agreeing with the dates of the periods of geochronology.

The historical process also has a quantum nature, since it was established that the dates of certain recent important world and regional events correlate with the calculated dates of changes in the spectra of combined fields [4]. In [2-4], it was shown that the history of mankind is divided into two eras, each lasting 4.4 million years: the completed era of the development of

rational man, aimed at the expansion of material prosperity, and the era of the evolution of spiritual man, striving to develop his spiritual qualities (which has already begun). In the model considered in [4], it is shown that the change of eras occurred (with sufficiently high probability) on 27.04.2008¹⁰, and that we are living in a transitional epoch with the highest rate of evolutionary changes, which will end in 2076 [2]. The greatest rate of growth of the Earth's population also falls on the change of eras [4].

Calculations of the parameters of micro- and macro-objects were carried out mainly for polarisation-equilibrium physical systems, i.e. systems that have completed the polarisation process. When studying quantum structures in which it is incomplete, additional empirical data are required, determining the phase of their dynamics of interest. For example, in determining the characteristics of the modern Universe, sufficiently precise empirical data on the density of microwave radiation were used [4].

The accepted methodological requirement of reproducibility of results in different laboratories is applicable in the case when all the conditions determining the experiment are reproduced. But the hierarchical formation of matter "from above downwards", uncontrolled in the experiment, influences the characteristics of first-hierolevel matter measured by instruments. The number of its particles in physical systems of high hierarchical level may be changed slowly by quantum processes at the highest hierolevel. Therefore, poor reproducibility may be due to different quantum states of the hierarchically organised macrosystem under investigation. The non-recognition of such experimental results hinders the study of the quantum physics of macro-objects.

The comparison of model calculations of a broad range of phenomena of inert and living matter with instrumental and subjective empirical data made it possible to conclude that the foundations of the QTE are empirically substantiated [5].

¹⁰In [1], global quantum transitions in the new era were considered, with a change in combined fields, with a calculated period of 139.82 days and determining the zone of their events with a width of ± 7 days. The first quantum transition initiated, in 2008, the beginning of a prolonged global financial and economic crisis. During the third quantum transition, BRIC was officially formalised. During the seventh quantum transition, the USA ratified the New START Treaty, and the "Arab Spring" began. An analysis of the dates of 63 regional-scale events (mostly political) during the two years after the 2014 coup d'état in Ukraine showed that most of them correlated with the dates of quantum transitions with a calculated period of 9.32 days, while a smaller part deviated from them by up to two days [4].

Its monofundamentalist approach allows fundamental physics to study the quantum properties of macro-objects and the possibilities of their practical use. It has yet to develop a quantum theory of transient processes in physical systems of the Universe possessing protostructure and to learn how to use the data of subjective methods of cognising reality, which make it possible to study the worlds of Everything unknown today.

Conclusion

The monofundamentalist quantum theory of an alternative worldview concept, agreeing with a broad spectrum of empirical data on phenomena of the micro- and macroworld, opens up, in the author's opinion, new possibilities in the development of fundamental science and its applied aspects. Therefore, an expert evaluation of the QTE for the correctness of its construction and its empirical substantiation is necessary, as well as a discussion by the physical community of the new worldview paradigm.

In 2024, a dialogue was conducted between the author of the QTE and AI (chat GPT-4-o) on ten general and particular problems of fundamental physics, the AI initially adhering to the positions of the established paradigm. Responding to the argumentation of the QTE, the chat accepted its positions on all ten problems [5, Appendix 1]. The argumentation used in the dialogues will be useful in the worldview discussion which, one may hope, will take place and determine the path of development of fundamental physics. If the quantum concept of Everything is recognised as substantiated, then fundamental science will face a paradigm shift to the monofundamentalist one [5], and in the foreseeable future a continuation of the quantum revolution in the microworld, which begun a hundred years ago, may become possible, but now at the macrolevel. It will become part of the transitional process of the change of eras in the evolution of mankind.

References

1. Chernukha V.V. *On Everything, the nature of living matter, and the physics of consciousness*. LELAND, Moscow, 2019.
2. Chernukha V.V. *Quantum Theory of Everything*. Triumph, Moscow, 2025.
3. Chernukha V.V. *Polarisation Theory of the Cosmos*. Atomenergoizdat, Moscow, 2008.
4. Chernukha V.V. *Physics of Unknown Reality* (collection of unpublished articles). LELAND, Moscow, 2018.

5. Chernukha V.V. *Science faces a change of worldview to the monofundamentalist one*. Triumph, Moscow, 2025.

6. Roshchin V.V., Godin S.M. Experimental investigation of physical effects in a dynamic magnetic system. *Pis'ma v ZhTF*, **26** (24), 70-75 (2000).

7. Chernukha V.V. *We and the worlds of the cosmos. A new physical picture of the world*. LELAND, Moscow, 2013.

Author information: Viktor Chernukha, independent researcher; email address: vchera10@gmail.com.

Statement

- The author received no support from any organisation for the submitted work.
- No funding was received for the preparation of this manuscript.
- No funding was received for conducting this study.
- No funds, grants, or other support were received.
- The author has no relevant financial or non-financial interests to disclose.
- The author has no competing interests to disclose that are relevant to the content of this article.
 - The author confirms that he is not affiliated with and has no involvement with any organisation or entity having any financial or non-financial interest in the subject matter or materials discussed in this manuscript.
 - The author has no financial or proprietary interest in any material discussed in this article.