METHOD OF TELEPORTATION BASED ON NATURE-LIKE USING OF BIOLOGICAL OBJECTS

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Annotation

SEFER hA MINAGIM, p. 574 (photo 1), on behalf of an older book, writes that according to Jewish tradition, the navel does not close completely after childbirth, but remains partially open to extract various infections from the body. "From the "greenness" called "gable- zaht" (די קרענק איז דזשאָנדאַס – disease jaundice), he will take a male pigeon for a man, and a dove for a woman; and put it on the navel, and the pigeon (dove), having drained all the infection from it (the patient), will die. Well-known veterinarian, Dr. Yekutiel Sharabi, owner of an elite veterinary clinic in Northern Tel Aviv, studied the causes of pigeon death after such a session. He found that immediately after treatment with pigeons, the patient's blood bilirubin level decreases by 25%, and recovery lasts an average of 3 days (as opposed to 28 days with conventional treatment). Autopsies of pigeons that died after the session showed liver enlargement and dysfunction. If the session was applied to a healthy person, not a single pigeon died. [1]

In this paper, we consider a heuristic method for using quantum teleportation protocols in convergent dual-use biotechnologies based on new physical principles of operation [1-80]. The features of these biotechnologies will be considered within the framework of the possibilities of convalescence of pathological conditions (for example, nosological form: liver damage (*lat. jecur, jecor, hepar, etc. Greek - ἧπαρ)* by the hepatitis "C" virus (*non-A, non-B hepatitis*, or *NANBH,* or HCV infection). A hypothetical convalescence technology can be implemented

by preparing cascades of entangled states of biological objects. In fact, this paper implies a certain information exchange in the planet's biogeosphere, hypotheses, protocols, and schemes for implementing these mechanisms based on new physical principles of action [1-80].

Keywords: quantum teleportation, entanglement, Bell state measurement, nosological form, convalescence, macroscopic teleportation, microtubules, objective reduction.

Photo 1: "The book of customs – ספר הטקסים" – SEFER hA MINAGIM.

An engraving. Amsterdam. 1662. Sotheby's Collection»

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- 03.65.Ud Entanglement and quantum nonlocality
- 03.67. - a Quantum information
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- 03.75.−b Waves of matter
- 75.45.+j Macroscopic quantum phenomena in magnetic systems
- 87.19.Nn Electrophysiology
- 87.23.−n Ecology and evolution
- 87.23.Kg Evolutionary dynamics

- 87.68.+z Biomaterials and biological interfaces
- 87.80.−y Biophysical методы research methods
- 87.80.Rb Tissue and cell engineering and biotechnology

Introduction

Let us consider the scheme of quantum teleportation of meso - and macroscopic states, which we proposed in 2018 [26], as a "tracing paper" of the material from the quantum teleportation protocol proposed by Bennett, Brassard, Crepe, Jossa, Perez, and Wootters in 1993, and which is a certain rewrite for our protocol (figure 1) [2]. And other protocols [8]. In this "tracing" "Alice" (see above), replaced by "Emelyan". "Bob" is nothing but the matrix of the space-time continuum with all dynamic cascading micro-, meso - and macroscopic relations, which for our wereley models in the cascades entangled (entangled, concatenated) states the entire space-time events, in which are immersed the experimental objects of our wereley model, in a state of relationship and interaction in terms of the known physical constants.
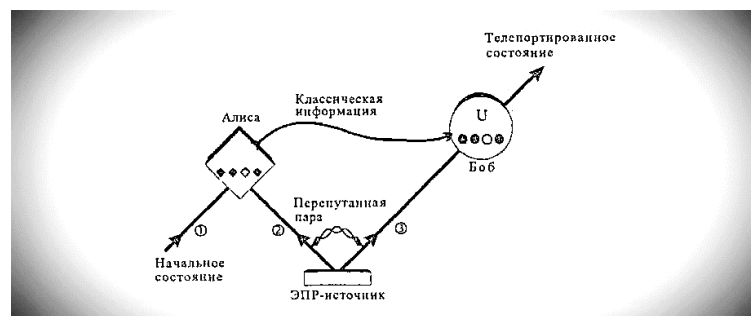

Figure 1. The principle of quantum teleportation of meso- and macroscopic states.

The main content

Let the patient Emelyan have a macro-object (liver affected by hepatitis «С»), equivalent in the given veral author's model to a quantum particle in a certain quantum state, is a qubit $y_1 = a\left|0_1\right\rangle + b\left|1_1\right\rangle$, where $\left|0_1\right\rangle$ and $\left|1_1\right\rangle$ are two orthogonal states with complex amplitudes a and b connected by the normalization condition

$$|a|^2 + |b|^2 = 1$$

. Emelyan needs to transfer this quantum state to the information system of the space-time continuum with entropy, with its further decoherence and degeneration in the patient, because two exactly similar objects cannot be located in time-like coordinates (as a special case of this: the information cloning prohibition theorem). But Emelyan cannot deliver its state (a wave packet, or the sum /superposition/ of wave packets) as a "particle" directly. As is known from quantum mechanics, any quantum measurement performed by Emelyan on his "particle" (state) will inevitably destroy the quantum state without obtaining the complete information necessary for the continuum matrix to recreate the original state: "Emelyan is a patient with hepatitis C" - in one of his virtual spaces. In the end, is the change in the initial dispositions of macro-states: "the real Emelyan hepatitis "C" – "1" – Fig. 1, "the dove of hepatitis on liver "2" – Fig. 1, "the dove of hepatitis in the wild "3" – Fig. 1 and "the space-time continuum with the virtual cluster "health record" (or "cluster virtual a healthy Emelyan"). On the disposition of the states: a "real and healthy Emelyan "1" on Fig. 1, "dove with hepatitis C retained in the liver of "2" – Fig. 2, "flown away dove – without hepatitis "C" "3" – Fig. 3 "a virtual patient with hepatitis "C" Emelyan" in probabilistic cluster space-time continuum. Emelyan makes a measurement, knowing that the pigeon is not sick, but he himself is sick. Releasing the second pigeon, it "informs" the space-time continuum in the classical form of information that the pigeon (released into the wild) is free of hepatitis. Then, according to all parameters of the protocol, after receiving a message from Emelyan, the space-time continuum captures this information (that is, it measures the state of the released pigeon). And he really is healthy. Then the second pigeon (initially held in the area of Emelyan's liver, and now sitting in a cage) – according to the conditions of the quantum teleportation protocol (entanglement of states 2 and 3 - i.e. pigeons among themselves) must be sick with hepatitis "C". Then, according to the terms of the quantum protocol, Emelyan is healthy. And as a result, we have the following states: "real healthy Emelyan", "pigeon with hepatitis "C"- sitting in a cage"," healthy pigeon in the

wild "and "virtual cluster of the space-time continuum – "Emelyan with hepatitis "C". It turns out a mirror image "top-bottom": at the bottom – "healthy Emelyan and a sick pigeon"; at the top – "sick Emelyan and a healthy pigeon". In this case, the states "sick Emelyan" and "sick pigeon" "die" (degenerate) from the observed physical reality and are transferred to the virtual spaces of the probability matrix.

To transmit the quantum state, it is necessary to use an auxiliary EPR pair of entangled particles 2 (a pigeon held on the area of Emelyan's liver) and 3 (a pigeon released into the wild) //note – these are so-called "understood" pigeons, i.e. a pair of pure-line pigeons, a male and a female, who have already brought offspring. Particle 2 (a pigeon on the liver) is given to Emelyan in the form of a pigeon placed and held for some time in the area of his liver, and particle 3 (a pigeon released into the wild) is sent (sent) to the information field of the continuum – an open system with entropy. Let the entangled pair of particles 2 and 3 distributed between Emelyan and the space-time continuum be in the state:

$$|y_{23}\rangle = \frac{1}{\sqrt{2}}\left\{|0_2\rangle|1_3\rangle - |1_2\rangle|2_3\rangle\right\}$$

(1.1)

An important property of this entangled state is that as soon as the measurement of one of the particles projects its definite state, which can be any normalized linear superposition of states $|0\rangle$ and $|1\rangle$, the other particle must end up in an orthogonal state. Specific phase relation between two terms in the right-hand side of (1.1) (here the phase difference is equal p, which is shown in the minus sign) implies that the orthogonality statement does not depend on the basis chosen for the polarization measurement.

Thus, Emelyan has a quantum system-particle 1 (liver with hepatitis "C") in the initial state, the state of which he wants to transfer to the continuum. Emelyan and the continuum also have one particle from the auxiliary pair of particles 2 and 3. Then, the continuum, being an open system, destroys coherence, i.e. performs a

joint measurement of the Bell state over the initial particle 1 and its existing particle 3 from the auxiliary pair, simply fixing their location in its probability and density matrices, i.e. performs physical registration of particles. The result of the measurement is the projection of both particles into an entangled state. By measuring Bell states, we mean not so much the act of physical registration of particles as a certain operation, as a result of which an entangled state of two particles is prepared, i.e., one of the four states:

$$\left|Y^+\right\rangle_{12} = \frac{1}{\sqrt{2}}\left(\left|0\right\rangle_1\left|1\right\rangle_2 + \left|1\right\rangle_1\left|0\right\rangle_2\right)$$

(1.2)

$$\left|Y^-\right\rangle_{12} = \frac{1}{\sqrt{2}}\left(\left|0\right\rangle_1\left|1\right\rangle_2 - \left|1\right\rangle_1\left|0\right\rangle_2\right)$$

(1.3)

$$\left|F^+\right\rangle_{12} = \frac{1}{\sqrt{2}}\left(\left|0\right\rangle_1\left|0\right\rangle_2 + \left|1\right\rangle_1\left|1\right\rangle_2\right)$$

(1.4)

$$\left|F^-\right\rangle_{12} = \frac{1}{\sqrt{2}}\left(\left|0\right\rangle_1\left|0\right\rangle_2 - \left|1\right\rangle_1\left|1\right\rangle_2\right)$$

(1.5)

This particle now has exactly the same state as the initial particle, i.e. in the continuum there is now (appeared) an information cluster independent of Emelyan with a virtual liver of virtual Emelyan, which is affected by hepatitis "C". And at this moment, Emelyan has – "not a liver affected by hepatitis "C", but a healthy liver. Particle 2 (pigeon held in the area of Emelyan's liver) is in an equi-final state. In the case of quantum teleportation of a qubit, Emelyan performs a projection measurement in four orthogonal states (Bell states) that form a complete basis. Communicating the Emelyan measurement result to the continuum, i.e. two bits of classical information, gives it the opportunity to recreate the initial qubit. Although initially particles 1 (Emelyan's liver affected by hepatitis "C") and 2 (pigeon held in the area of Emelyan's liver) are not entangled, their joint (electrodynamically, including optically – chiral?) a state can always be

represented in the idea of a superposition of four maximally entangled Bell states (1.2) – (1.5), since these states form a complete orthonormal basis. The general state of particle 3 is written as

$$|Y\rangle_{123} = |Y\rangle_1 |Y\rangle_{23} = \frac{1}{2} \left\| \begin{array}{l} \left|Y^-\right\rangle_{12} (- a|0\rangle_3 - b|1\rangle_3) + \left|Y^-\right\rangle_{12} (- a|0\rangle_3 + b|1\rangle_3) + \\ \left|F^-\right\rangle_{12} (a|1\rangle_3 + b|0\rangle_3) + \left|F^-\right\rangle_{12} (a|1\rangle_3 - b|0\rangle_3) \end{array} \right\| \qquad (1.6)$$

Emelyan now measures the Bell states of particles 1 and 2, i.e., projects the two particles in his possession into one of the four Bell states. As a result of this measurement, it turns out that the continuum particle will be detected in a state that exactly corresponds to the initial state. For example, if the bell state measured by Emelyan coincides with $\left|F^-\right\rangle_{12}$, then particle 3, which is in the continuum, is in the state $a|1\rangle_3 + b|0\rangle_3$. All you need to do Emelyan is "*to inform*" (just a fact of the physical registration of a set of states and transitions automatically occurring in the simulated system) the space-time continuum through a classical communication channel (*in the form of a variety of electromagnetic fields emitted from objects and is, in turn, a set of intricate cascade - including the state*) on the result, so to speak, of measurement, and the continuum needs to perform the corresponding unitary transformation on particle 3 (dove, released into the wild), to obtain the initial state of particle 1 (of a liver affected by hepatitis "C"). Which is realized in the external environment, which is the current space-time mode of the continuum, and is implemented in the self-oscillating mode. This completes the protocol. *A virtual cluster is formed in the space-time continuum, filled with information "virtual quantum phrases", semantically equivalent to the clinical picture of the liver affected by hepatitis "C" Emelyan.*

During the teleportation procedure, the values a, b remain unknown. From his measurements of Bell states Emelyan does not receive any information about the teleported state. *That is, system 1, 2, 3 is completely non-deterministic at this point.*

That is, who has hepatitis "C" is not known. And is he ill at all? The only thing that is achieved when measuring Bell states is the transfer of the quantum state. During these measurements, particle 1 (Emelyan's liver affected by hepatitis "C") loses its initial quantum state (it is cured), because it becomes entangled with particle 2 (a pigeon held in the area of Emelyan's liver), which is then removed from the system (the pigeon dies). Therefore, the state $|Y\rangle_1$ is destroyed by Emelyan during teleportation (which is the beginning of the convalescence process), which satisfies the requirement of the cloning prohibition theorem. Moreover, the initial state of particle 1 (Emelyan's liver affected by hepatitis) may not be identified at the moment under the conditions of classical quantum teleportation protocols. This is the objectifying factor of the correctness of this veral experiment, this meta-model. This state is quantum mechanically completely indeterminate, at the time when the bell state is measured. *This is the case when particle 1 is part of an artificially prepared, entangled pair and therefore, by itself, at the time of preparing, does not have certain deterministic properties, but begins to exist only as a probability of opposite states (a superposition of possible states). This results in an exchange mix-up. And then by reducing the states (after the execution of this protocol) to the desired state "healthy liver".* In the process of implementing the protocol, there is no loss of information due to decoherence when interacting with the external environment, because such a complex system as a biological object that exists in the framework of highly nonequilibrium states and nonlinear processes, in combination with rather complex systems endowed with feedbacks, contains subsystems that constantly fluctuate. Sometimes a single fluctuation or combination of fluctuations can become so strong (as a result of positive feedback) that the pre-existing organization breaks down and collapses. At this tipping point (at the bifurcation point), it is fundamentally impossible to predict in which direction further development will take place: whether the state of the system will become chaotic or it will move to a new, more differentiated and higher level of order. The cascade of "chain reactions" in the framework of multiple interactions of a huge number of microparticles, their entanglement, natural formation of

coherent states, decoherence and other processes is virtually endless. Therefore, irretrievable loss of quantum information is not possible.

Through the "chain" of interactions, the "disappeared" information does not disappear, but is manifested and stored in the form of secondary sequential clusters of entangled particles and their cascades. They, in turn, leaving the system ("disappearing") when interacting with the external environment, manifest themselves in chains of constantly renewed states of entangled clusters, equivalent and similar to those already removed from the system ("disappeared"), since we operate in the protocol with self-organizing systems. We only set the vector of motion and development of the system, and it is organized in itself when the motion vector we set is projected onto all the state vectors of the system, causing a cascade of transformations set by the motion vector. So the information is not lost when teleportation of states, in the performance of our protocol.

A method for teleporting states based on the direct use of biological objects, without various technical and bionic tricks, is proposed [3-6]. Directuse of biological objects seems to be immeasurably cheaper and easier to perform [4]. This allows you to work with the teleportation of macrostates, oddly enough, without information losses and the influence of decoherence of the external environment. Although the method using likenesses (liquid crystals) was considered by us earlier [9, 10]. Although no less efficient and reproducible.

The mechanisms of quantum teleportation, in the case of teleportation of states of macroobjects, due to the formation of a whole cascade of entangled states, are much less susceptible to decoherence when interacting with the external environment, in contrast to the limited composition of qubits when performing some classical protocols [8]. This is the difference between bioobjects and artificially created quantum qubits. Man has not yet created perfection similar to bio-objects in their not yet sufficiently studied information interactions [4]. This is the meaning of likeness of nature of the technologies presented here, which can be used to solve combined, unique [5, 9] and some special problems [9-23]. For

example: at a great distance, there is an object " A "that needs to transmit some (any - physical, physiological, psychophysiological, biochemical) state from object" B", previously entangled with object "C" and "A". And this state is highly likely to be teleported to object "A". At the same time: we will lose the object "B" (in one way or another it will be taken out of the system - destroyed in one way or another to a state with high entropy); coherent states will not be destroyed during transmission over long distances, as in the case of classical protocols for quantum teleportation of states of micro - objects. The preparation of entangled states of macro objects seems quite simple – all you need is that all the objects are first "hooked" according to a special combined scheme [1 – 7, 9 – 23]. In this case, "A", "B", "C" will not even suspect what is happening (happened, will happen). It will be impossible to prove the fact of external interference on the basis of the technologies and means that are currently available to the scientific and technological machine.

The following heuristic equation for macroscopic entanglement was proposed, experimentally and theoretically verified [24, 25]:

$$\overset{\&}{s_d} = s \, \mathbf{T} \, \frac{\overset{\&}{s}}{x} d(v^2 t^2 - x^2) dV$$

where $\overset{\&}{s_d}$ - the production of entropy per particle in the trial process (detector); $\dot{s}$- the full density of entropy production in the sources (the integral is taken on the source volume); v - velocity of propagation; $\sigma \approx \hbar^4/m_e^2 e^4$ - the transaction section (of the order of the cross section of the atom tends to zero in the classical limit); m_e is the electron mass; e - elementary charge. The Delta function indicates that a transaction occurs with a symmetric delay and advance. The speed of propagation for diffusive exchange of entanglement can be very small. Accordingly, the delay and advance can be very large.

Analysis of this problem shows that interactions of a microobject with the environment, which irreversibly destroys the quantum state, lead to the collapse of wave functions, and, consequently, to the destruction of coherent quantum

behavior. This effect has been called "amplification", which turns the superposition of states of a microscopic system into a superposition of states of a macroscopic system.

The amplification mechanism consists in the formation of an entangled state involving a macroscopic number of subsystems (or degrees of freedom). This means that when "amplification" occurs, the interaction of a quantum system (in a superposition state) with other systems (or degrees of freedom) occurs, causing entanglement (quantum correlation) with them. Then both the original system and the systems already entangled with it interact with even more systems, involving them in an entangled state. This happens until an entangled state is formed, involving a huge number of systems, or at least a huge number of degrees of freedom. If such processes cover a sufficient number of degrees of freedom, then the resulting state cannot be interpreted otherwise than as a superposition of macroscopically distinguishable states of the macroscopic system.

If the number of systems involved in the interaction is macroscopically large, then the Emelyan system becomes entangled with the macroscopic pigeon system (or other biological objects or special biological environments with "quantum dots"), and a superposition of two different states of the macroscopic system is formed.

The superposition states are "macroscopically distinguishable" in the sense that a huge number of degrees of freedom in them are described by different wave functions. Thus, there is a superposition of macroscopically distinguishable states of the macroscopic system.

And then we can conclude that superpositions must exist even for arbitrarily large systems (having arbitrarily many degrees of freedom).

Naturally, the question arises whether it is possible to create and observe superpositions of distinguishable states of macroscopic systems.

Based on the above, we can conclude that it is possible to create maximum entanglement between two macroscopic systems if the following conditions are met:

1. If these systems are represented by particles with spin 1/2 in the singlet space

state? And this is the entire set of fermions and quasiparticles formed from them in a nonlinear biological object.

2. If these systems are represented by identical particles? And these are biological objects with an equivalent and, of course, identical set and volume of particles.

3. Dynamics of these systems should not destroy the connection between spin and statistics? The connection statistics of the Pauli theorem, Bose-Einstein statistics, as well as Fermi-Dirac statistics, will not be violated for the reason that there is nothing more efficient and reliable for the resistance torum of natural long-term storage of entangled states already produced by nature in living systems of biological objects, and not in any artificially created by man. The creation of such artificial objects by humans in the near future does not seem realistic.

This article was written and edited based on the publication [26].

Some mathematical apparatus of the processes described above is currently presented in the necessary and sufficient form in [27].

The history of research on this topic was discussed earlier in [28].

The role of the operator's higher nervous activity involving molecular mechanisms and processes in the execution of the quantum teleportation protocol is considered in [74-80].

Conclusions

In fact, in this paper refers to an information exchange in biogeosphere planet, hypotheses, protocols, and implementation scheme of these mechanisms, based on new physical principles [1 – 80], and ending with the possibilities of applying processes that resemble natural ones with a minimum of technical means [26],

based only on one – specified model of the interaction of biological objects. The authors would like to see the practical application of the described mechanisms in the framework of solving medical and biological problems – including, first of all, for the rehabilitation and possible convalescence of patients with various nosological forms. The authors, in their previous works on the study of quantum information teleportation between macroscopic objects and systems [17-61], also considered the mechanisms of such interaction at the level of natural biogeocenoses [17-19] and some issues of studying processes based on new physical principles of action [50-61]. The non-local nature of functioning mediated by nervous processes is described by the example of complex instincts of birds [75]. And in an explicit nature-like form, it is shown in [26] exactly as it could occur naturally in the interaction of biological objects with each other and the environment [7, 8, 9, 26, 53, 65 – 68, 81], within the framework of biogeocenotic relationships in ecosystems.

Currently, at the forefront of medical science are located, including in the first place, research in the field of IT – technology in medicine. The authors consider [17-61] the possibilities of IT – quantum technologies, as well as some mechanisms of nature – like interaction of biological objects with a minimum of electronic filling of the element base [26, 65].

Finally, in the near future, quantum computers and related technologies will simulate complex biological processes at the micro- and meso- levels – in 4-D format and dimensionality, and 4-D printers (including non-local 4-D printers) these processes should be materialized (determined) as a result of a certain chain of nonlinear cascades of decoherence into classical objects (processes) by the vectors specified by the operator. Conceptual approaches and "hints" on the possibility of such mechanisms were proposed by us in the previous article [17 – 20, 28 – 30, 32, 35, 36, 41 – 49, 53 – 57, 59, 61].

For the implementation of this protocol, it is also necessary to take into account the role of operator consciousness according to other protocols and examples considered in [74-80].

In 1989, a book by Oxford Professor, member of the American Academy of Sciences sir Roger Penrose was published "The new mind of the king" [77], in which the author presents his thoughts about "quantum consciousness" and the theory of so-called strong artificial intelligence, justifying the inconsistency of implementing such a form of artificial intelligence.

Together with Roger Penrose – Stewart Hameroff [76] created the "orch-OR "model of consciousness" (from the English *Orchestrated Objective Reduction* — Ordered objective reduction [quantum coherence]) in 1994, on the basis of which the" Theory of quantum neurocomputing" was developed, which was called the "Hameroff-Penrose Theory". According to this model, brain activity is considered to be essentially a quantum process that follows the laws of quantum physics.

Matthew Fisher [79] (English *Matthew P. A. Fisher*, a physicist at the University of Santa Barbara in California, after successfully treating depression in the late 1980s, became interested in the neurobiological mechanisms of antidepressants and thought about the possibility of quantum processes in the brain. In 1986, the mechanisms of influence of lithium isotopes on rats and differences in the behavior of rats treated with lithium-6 and lithium-7 isotopes were investigated. Fischer suggested that, with identical chemical properties and a slight difference in the atomic masses of lithium isotopes, the difference in rat behavior is explained by the spins of the atoms and the decoherence time. Lithium-6 has a smaller spin and, accordingly, can remain "entangled" longer than lithium-7, which, according to Fischer's reasoning, could indicate that quantum phenomena can have a functional role in cognitive processes. During a five-year search for a store of quantum information in the brain, Fischer identified phosphorus atoms for this role, which, in his opinion, when bound to calcium ions can produce a fairly stable qubit. In 2015, Fischer published an article in the journal Annals of physics about a

hypothesis postulating that the nuclear spins of phosphorus atoms can serve as something like qubits in the brain, which can allow the brain to function like a quantum computer. In the article, Fischer stated that he had identified a unique molecule ($Ca_9(PO_4)_6$) that preserves "neuro-qubits" for a long time [78-80].

"To describe those properties of consciousness that are difficult to understand in terms of ordinary neurophysiology: the difference between the state of the brain and consciousness, the existence of internal experience – quantum theory is used. It is assumed that the description of consciousness requires the phenomena of quantum coherence, as well as a new physical phenomenon of "self-collapse" of the quantum wave function, which can be observed in the microtubules of the cell skeleton and other structures of each brain neuron and be associated with the conformational states of microtubule elements (protein dimers - tubulins). Further, it is assumed that a macroscopic coherent superposition of quantum-correlated conformational states of tubulins is observed in large areas of the brain and ensures the unity of consciousness. This coherence is self-maintained until the mass-energy difference between the individual tubulin states reaches a critical threshold associated with quantum gravity. Upon reaching this threshold is "self-collapse" superposition of quantum states of tubuline one microscopic condition. This "self-collapse" of the quantum state of the brain is identified with the act of conscious thinking. Since the model of gravitationally induced reduction of the wave function is used, such a reduction means simultaneously choosing the geometry of space-time. In connection with consciousness, this in turn means that the act of awareness "can cause self-perturbations of the geometry of space-time" (p. 467).

"Quantum theory is based on the wave/particle dualism at the level of atoms and their components. As long as a quantum system (atom or subatomic particles) remains isolated from its surroundings, it behaves like a "wave of possibilities" and exists as a coherent "superposition" (with complex-valued coefficients) of many different states. There are different points of view on how a quantum superposition of states "collapses" or "reduces" to a single classical state. The generally accepted

view (Copenhagen interpretation) is that the quantum state is reduced due to quantum correlation with the external environment, measurement, or conscious observation (subjective reduction: SR or R). Where a quantum particle is located and how it moves during observation is "undetermined", which, according to the Copenhagen interpretation, leads to random measurable quantities. Our point of view is that a new physical phenomenon (objective reduction (OR)) is needed to address this issue: coherent quantum systems can "self-collapse" when they reach the critical mass-time-energy threshold associated with quantum gravity. Another property of quantum systems is quantum non-separability or non-locality, which implies that all quantum objects that have once interacted continue to be connected in some sense! ... Where and how can quantum phenomena be observed in the brain? At first glance, it seems that the warm, humid, and noisy brain is a hostile environment for delicate quantum phenomena, which usually require isolation and cold rest (superconductors) or energy pumping of crystals (lasers). Nevertheless, various authors have considered ion channels, ions themselves, DNA, presynaptic lattices, and cytoskeleton microtubules as elements mediating "standard" quantum effects" (pp. 455-456).

From the authors' point of view, the microtubules of cell skeletons are the most likely objects for quantum coherence, OR and consciousness. "The ideal properties required for the manifestation of quantum properties of brain structures seem to be as follows:

- prevalence rate;

- functional significance (for example, regulation of neuronal connections and synapse functioning);

- periodic, crystal-like structure with long-range order,

- ability to temporarily isolate from external interaction/observation;

- functional connection with the phenomena of the quantum level and ability to process information.

Membranes, membrane proteins, synapses, DNA, and other cell structures have some of these characteristics, but not all. Microtubules of the skeleton of the cell, appears to possess all of these qualities" (p. 459).

Networks of self-assembling protein polymers, i.e. the cell skeleton, the cytoskeleton of a neuron supports its shape, synaptic connections, and performs other important functions. The main components of the cytoskeleton are microtubules: empty cylindrical polymers consisting of individual proteins and tubulins. Each tubulin is a polar dimer, a dipole. Microtubules have piezoelectric and ferroelectric properties. Microtubules are connected to each other and other cell structures by specialized proteins, these connections form lattice networks of the cell skeleton.

Some studies show that the functioning of the cell skeleton can be essential for cognitive processes: studies of visual perception in cats, rats, memory and learning in chickens, learning and memorization processes in the mammalian hippocampus.

How can the cytoskeleton transmit and process information, i.e. participate in the brain's processing of external impulses prior to the act of awareness? Tubulin can be in several conformational, i.e. geometrically different, states. It is assumed that the dynamics of tubulin conformation patterns in microtubules is responsible for the processes of information transmission, processing, and storage. Several models of signal transmission and information processing in microtubules and other components of the cytoskeleton have been proposed. The authors consider microtubules as a "cellular automaton".

Information processing in microtubules is discussed in a separate section of the article, which presents the results of computer modeling of conformational transitions of tubulins. The latter were considered as "cellular automata", i.e. complex structures consisting of a finite number of simple elements with the following properties:

- at a given time, each element is in one of a finite number of states (two for simplicity);

- these elements form a structure with a fixed geometry;

- each element interacts only with its neighbors;

- the universal "clock" provides coherence of transitions so that each element can move to a new state with each "clock tick";

- the transition rules for state changes depend on the "real" state of each element and its environment;

- depending on the initial conditions (initial patterns), simple transition rules lead to complex dynamic patterns that can perform calculations.

Von Neumann proved that cellular automata can function as Turing machines, i.e. as computing devices analogous to computers.

The Frehlich excitation mechanism was used as the "clock" that sets the rhythm of conformational transitions in automaton microtubules, and the electrostatic forces of dipole interaction were used as the "transition rules" from one conformational state to another.

Each tubulin has a large hydrophobic region – a nonpolar bag of amino acid groups that interact via van der Waals forces. Electron localization in the hydrophobic tubulin bag is associated with a conformational transition in the tubulin dimer. Recall that the general premise of the model is that protonotariou have all phenomena and, in particular, electron, and according to the authors develop ideas protosatellite free electron manifested at the time of its localization, the transformation from a wave into a particle.

Nobel prize winner Herbert Frelich, who made a major contribution to the understanding of superconductivity, also predicted the existence of quantum coherence in cells. Frelich suggested that under the condition of energy pumping, many dipoles of proteins located in a common electromagnetic field (for example,

proteins in a polarized membrane, elements in an electret polymer similar to microtubules) are subject to coherent conformational excitations. Frelich postulated that biochemical and thermal energy comes from the external environment. Cooperative, organized processes leading to coherent excitations, according to Frelich, arise in connection with the structural coherence of hydrophobic dipoles in the general field gradient. "In quantum physics, such coherent states were called Bose-Einstein condensates. Marshall suggested that they provide quantum coherent states that maintain the unity of consciousness" (p. 464).

The results of computer modeling show that patterns of microtubule automata can provide information transfer, processing, and storage. At the same time, it is noted that "considering only classical calculations and local interactions of neighbors, it is hardly possible to find approaches to complex qualities of consciousness with the help of microtubule automata, for the description of which hopes are pinned on quantum theory" (p.465).

It is assumed "that pre- and subconscious information processing corresponds to a quantum coherent superposition that can perform 'quantum computing'. A number of authors have suggested that quantum coherence can perform several computations simultaneously, in parallel, in accordance with a quantum linear superposition: the state of the superposition "collapses" into a specific result of the calculation" (p. 466). "A quantum superposition that is reduced by the external environment or observation (SR or R) does not have the property of non-computability and therefore is not suitable for consciousness. The large-scale quantum coherence observed between tubulins could perform quantum calculations in pre-conscious and subconscious processes" (p. 467). It is also assumed that "non-conscious" autonomous processes correspond to classical, non-quantum computations in microtubule conformational automata. Thus, the objective reduction or further-OR-transition from quantum, preconscious information processing to classical, non-conscious processing can be closely

related to consciousness itself. But what is consciousness? According to the OR principles, each of the quantum states in superposition has its own space-time geometry. When the difference between these states leads to a sufficiently large difference in the corresponding space-time geometries, the system must make a choice and disintegrate (reduce or collapse) to a single state... The transition state of a superposition of slightly different spacetime geometries exists until a quantum-classical reduction occurs and one of them is chosen. Thus, consciousness can cause self-perturbations of the geometry of space-time (p. 467). We emphasize once again that the various quantum states included in the superposition are conformational states of microtubule tubulins.

The OR implementation criterion: "the gravitational energy of a quantum superposition of masses whose displacement over a given time sufficiently perturbs spacetime so that OR occurs is taken from the "uncertainty principle»: $E=h \, / \, T$, where h is the Planck constant divided by 2π, and T is the coherence time" (p. 468). The coherence time T is estimated based on experimental psychology data on measuring the time of pre-conscious processes: it was found that it is about 0.5 seconds. Estimating the conformational transition energy of a single tubulin makes it possible to estimate the number of tubulins that must be involved in coherent conformational transitions in order for the total energy to be sufficient for OR: about 10^9 tubulins. The estimation was carried out within the framework of the non-Newtonian theory of gravitation, and three different representations of tubulin were considered:

- as two spheres representing two monomers of a protein dimer;

- as a collection of carbon atoms;

- as a set of nucleons, i.e. neutrons and protons that are part of the nuclei of carbon atoms.

For the model of consciousness developed by the authors, the essential question is: "how can quantum coherence in microtubules be isolated from quantum correlation

with the external environment?" "At first glance, it seems that the internal regions of cells are poorly suited for quantum effects. Thermal "noise" of intracellular water can lead to a violation of the coherent state and SR or R collapses" (p. 473). Several factors that can provide microtubule isolation and support quantum coherence are discussed: the "coat" of ordered water around microtubules, as well as isolation inside their hollow core, and screening with gel cytoplasmic layers.

The next essential element of the model is associated proteins that connect microtubules to each other and other cell structures. These proteins can serve as "conduits" for the emergence of a quantum correlation between the state of microtubules and the "noisy "random external environment and, accordingly, to the" standard " collapse of the wave function (R or SR), which is not related to the act of awareness. In this regard, it is assumed that these proteins are connected to "each microtubule in such places that (at least temporarily) are not active against quantum correlated conformational changes" (p. 477). These connection points of microtubules with each other and with other cell structures are considered "as effective nodes "for their quantum oscillations, which, together with genetic and other modifications of tubulins," orchestrate "the quantum coherence of microtubules and subsequent PROCESSING. Therefore, the specific objective reduction (OR) that occurs in the microtubules and is associated with awareness is referred to as "orchestrated objective reduction" (Orch OR)" (ibid.).

Based on experimental data on the number of tubulins in one neuron (10^7), an estimate is given of the minimum number of neurons that is necessary for the implementation of Orch OR: about 100 neurons. "The nervous system of organisms such as the nematode C. Elegans contains several hundred neurons. Functional groups of neurons involved in human cognitive processes are estimated to contain about 10,000 neurons, which can be widely distributed throughout the brain" (p. 475).

Thus, the model developed by the authors contains the following components.

- A macroscopic quantum state of coherent superposition can exist between microtubule tubulins in large brain regions.

- This quantum state can be maintained without significant quantum correlation with the environment for a certain period of time (up to 500 msec).

- Cooperative interactions between neighboring tubulins in microtubules can process information like cellular automata. The existence of two types of computational processes in microtubules is proposed:

- classical calculation: conformational patterns propagate through the cytoskeleton, regulating the activity of synapses and other functions of neurons. This mode correlates with unconscious and autonomous activities;

- quantum computing: quantum coherence on large scales is realized between tubulins and plays the role of a quantum computer, in which many "computations" occur simultaneously, in parallel, in accordance with the quantum linear superposition" (p.476). Quantum computing is identified with pre- and subconscious information processing.

In quantum computing, changes in dimer conformations lead to mass motion, hence to a change in the geometry of the space-time conformational state. The time scale T is estimated and the number of tubulins in the state of coherent superposition, which is necessary for the self-collapse of an objective orchestrated reduction: Orch OR, is calculated. Since quantum computing is identified with preconscious information processing, for $T = 500$msec, a rough estimate is obtained – 10^9 tubulins required for Orch OR.

Microtubule-associated proteins associated with some microtubule tubulins appear to be one of the possible causes of the quantum correlation of tubulin states with the "noisy" random external environment. The conditions of isolation of these proteins and other mechanisms of isolation of the microtubule state were mentioned above.

Orch OR - the process selects a variety of new conformational states of tubulins in microtubules that provide various functions of neurons and affect synaptic connections and functions of other cellular structures.

Constancy and global unity of consciousness is seen as a property of large-scale quantum coherence, covering most of the brain.

Variations in Orch OR due to different coherence times and the number of coherent tubulins can combine in conscious thought. Very intense, sudden external pulses can lead to the appearance of quantum coherence of tubulins faster than 500 msec, so Orch OR will occur faster. Low-intensity signals lead to slower coherence development and Orch or occurs later. Instantaneous Orch OR can "link" various superpositions of tubulins that have evolved from spatially different distributions and at different times-into an instantaneous conscious "now". Orch or cascades are a well-known "stream of consciousness"" (p. 478).

The idea of objective reduction of the wave function was developed by R.Penrose in [81].

The work is based on previously published materials [26].

Results.

We conducted testing (in the laboratory and on our own initiative) on a very limited number of patients with multiple sclerosis – in terms of the impact on the problems associated with the underlying disease with normal physiology. For example: the patient "S" with the first group of disability in multiple sclerosis. As a result of cardiovascular insufficiency, edema of the upper and lower extremities occurred, followed by the development of ascitic exudate in the abdominal cavity. After the protocol described above, the clinical symptoms disappeared on the second day. One of the pigeon pairs involved in the experiment died two days later. Unfortunately, our research statistics are negligible. But we hope for numerous practical verifications of our protocol given in this model, and we hope that it will be repeated many times by our colleagues in the near future.

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