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CHARACTERISTICS OF FREE STATE OF MATTER

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The questions are discussed on its main characteristics based on the hypothesis that all fundamental forces of interaction lack in free state of matter in the commonly accepted physical sense. The concept of free energy was explained within the paradigm of the eternal cycle of matter. Possible mechanisms of manifestation the free state of matter were given in its physical and biological forms.

Keywords: matter, free state, eternal cycle, information, energy

A new concept - free state of matter (FSM) was introduced to the scientific circle within the paradigm of eternal cycle of matter (ECM) in this paper [4]. According to definition, the FSM consists of free space, information form and free energy. These types of the FSM have no energy and material characteristics in the commonly accepted physical sense. Therefore, it is necessary to accept the hypothesis of the absence of force of fundamental interactions in the FSM accepted in physics in the studies of their characteristics. The main characteristics of the FSM (non-wearability, inexhaustibility and boundlessness) which had previously been discussed [2,4] follow from this definition directly. This problem is studied below in more details, but free energy, free space and information forms are separately considered in the context of physical and biological forms of matter for simplicity of further discussions.

The ability of information form (including cognitive system) and free space of matter to carry out the work is accepted under the concept of free energy in the paradigm of the ECM. It is known that the information is not measured by material and energy units and by their derivatives. Units of measurement the information reflect its quantitative characteristics where there is functional definition. Therefore, they have no physical meaning, and, furthermore, don't have physical characteristics. Consequently, there is no sense in trying to measure the information by standard physical methods. Energy of information form of the FSM can be called energy information similar to electric or thermal energy. Units of measurement the considered energy also immediately

follow from these names with physical prerequisites.

Information energy is converted into various forms of energy in conjunction with other forms of matter and materialized [2].

Free space provides geometric opportunity of an existence of all forms of matter. If we talk of the ability to carry out the work of all forms of matter so, its certain part should be related to the contribution of free space and that part should be related to free energy. In this sense, this part of free energy in the composition of other forms of matter in the form of their geometric forms of the existence had already been materialized and can be measured by simple physical methods.

Let's consider the interaction of free space with the physical form of matter in the process of compression of the latter for a clearer presentation.

The volume decreases in substance compression, mass is saved, the density increases. It is a commonly observed phenomenon in experiments within Newton's mechanics. And what happens in large values of compression considering the microstructure and quantum processes? Let's consider the simplest case - slow continuous compression to answer this question. The decrease of initial volume V_0 occurs regardless of its geometric scale. Let's assume after a certain stage of compression that the volume became V_1 , i.e. space equal to $V_0 - V_1$ that previously was occupied by substance became free. Subsequently, the space $V_0 - V_1 - V_2 - V_3 \dots = V_0 - \sum_{k=1}^n V_k$ is

freed. The space $\sum_{k=1}^n V_k$ in the volume V_0 enabled the existence of substance in a geometric form that it had in the initial state (before compression) and the degree of freedom to move molecules, atoms and elementary particles in conventional and probabilistic sense. While reaching a certain value n (for example, n_*), the geometric scale becomes so small that the degrees of freedom of movement of molecules, atoms and electrons disappear gradually. The electromagnetic interaction disappears from a certain level of compression or the geometric limit. The failure of spin motions also occur as a result of geometric restriction in these and possibly in smaller geometric scales. The degrees of freedom the motions corresponding to weak and strong nuclear interactions consistently disappear in the microstructures in the process of further compression with decrease of geometric scale.

The mechanism of the interaction of space and substance is shown quite evidently in this example. It can be seen that one of the main features of space is enabling various substances and bodies to have a geometric form and motion capability including the appropriate degree of freedom.

To be specific, let's consider the behavior of the crystal NaCl in compression. It is known that its microstructure consists of a perfect lattice of cube in vertices of which ions Na and Cl are in a certain order. The distance between these ions is determined by the "optical" constant $D = 2,8 \cdot 10^{-10}$ m. In this case, "crystallographic" constant is $A = 5,6 \cdot 10^{-10}$ m. Action of repulsive forces dominate in the scale of "optical" constant, but forces of gravity dominate at larger distances. The space is freed reducing the size by the "optical" and "crystallographic" constant at significant values of compression. These dimensions disappear (a transition to a different symmetry occurs) in further compression which limits geometric opportunities of the existence of repulsive forces. Herewith, certain mechanisms of the interaction that exist to these limits of compression also disappear. The fact is that along with the change in the microstructure of the substance (a new material substance formed), a

change also occurs in the structure of the interaction of space with the newly created material substance. The outer geometric dimensions of material substance are reduced in all these processes and more space is released from the "prison". Release of free space is accompanied by "suppression" of giant repulsive forces acting in the "optical" scale. The repulsive forces are compensated by gravitational forces and forces of gravity are added to them in the process of "suppression". As a result, a change of symmetry occurs. Higher level of external gravitational forces which is increased all this time on the above mentioned mechanism is necessary to maintain the new symmetry. Questions on the change of different symmetries in the ECM were previously considered [1].

Similar arguments can be set relating to the Van der Waals forces and valence forces. The Van der Waals forces - are the special attractive forces of attraction in the intermolecular interactions. These forces are significant at relatively large distances where short-range valence forces are negligible. They are quantum and disappear in the transition to the classical approximation [3]. The valence forces are related with the spins of the electrons and nuclei. The interaction is reduced to the fast-growing repulsion at small distances. Electron shells of atoms and ions are crushed, the space is freed and significant changes occur in the properties of substances at further compression (pressure higher than 10^7 atm.). The spin motions etc. are limited in these geometric borders.

The described scenario of the interaction the physical form of matter with its free form occurs in the process of formation of "black holes". The existence of matter is only one of the fundamental forces of the interaction - gravity in this state. Moreover, the interaction is also implemented between the "black hole" and free space. It is appropriate to make the following remark. A problem creating a theory unifying all fundamental forces of the interaction exists in theoretical physics for a long time. But in the case of "black holes", the question isn't on the unification of the electromagnetic, weak and strong nuclear forces of the interaction, as they simply don't exist. The

substance takes up less place as a result of the formation of "black hole", thereby free space increases in the local astronomical scale.

Similar processes are also implemented in the quantum geometric microstructures of atoms. Their new fundamental property of interconversion, as well as the existence of antiparticles was discovered with the appearance of the positron. In particular, the appearance of the positron can be considered as the conversion of the gamma-quantum into electron-positron pair, and the annihilation of electron-positron pair - as reconversion of this pair into the gamma-quantum. These experimentally confirmed physical processes show that the cycle of matter also happens in sufficiently small quantum geometric scales. The quantum geometric scales gradually decrease and the above mentioned conversions stop in the microstructure of substance at large values of compression. The freed volumes irrespective of their values are added to the free space. The compressed substance continues to participate in other scales of the ECM regardless of its physical and geometrical characteristics.

It should be noted that the compression velocity and methods of its implementation, in principle, don't influence on the process of release of free space and form taken by substances with minimal potential energy. They can only cause a variety of mechanisms to implement the happen processes and any adverse events.

A system of communication of human's brain is the densest structure in the case of biological form of the matter. A mechanism of creation of a free form of matter by human's brain was outlined in the paper [4]. A different kind of free form of matter - the cognitive system is created in the ECM due to participation of this dense system. In this case, the existence of dense structure is a necessary condition to create a free form of matter. However, the essence of these necessary dense structures in physical and biological forms differ fundamentally. In the first case, it excludes the possibility of the existence of fundamental forces of the interaction apart from gravity that leads to the "liberation" of the earlier former spaces in "prison". In the second case, the density of communication nets contributes to creation the

cognitive system which is free of all forces of the interaction and is used in communication and information transfer. All the fundamental forces of interaction continue to carry out its functions in this process. But it is not sufficient to create the matter in the form of free state. An additional ability to communicate using the capabilities of the mind is sufficient. The cognitive system in the ECM participates only through the participation of rational beings, the human in the case of our planet. Thus, a sufficient condition of the formation and existence of "black holes" in the ECM is the participation of only the gravitational forces of interaction, and rational beings to form cognitive systems of free matter. In the latter case, in addition to all the forces of interaction, a new fundamental force of interaction - social (communication, memory) is included to the ECM.

Consequently, with the participation of biological form of the ECM, the nature chose the other option to reach the free state, the characteristics of which can't be physically measured by available means.

The acquisition of form with a minimum potential energy happens by substance in the process of the formation of "black holes" along with the release of space. Moreover, part of the previously existed and required information is destroyed within the "black holes" as a result of the decrease of free space. In contrast, its enrichment occurs in the process of formation of the cognitive system all the time.

The existence of the FSM and its properties of continuity also enables to make significant clarity to the question on the duality of matter structures, i.e. wave and discrete. Free space is continuous (wave), but its substance part is discrete.

Free space also enables to develop methods to study the numerous problems of various disciplines. For example, a variety of information on the universe was given by light, radio waves of cosmic bodies and a stream of cosmic particles for a long time [3]. A new opportunity appeared in this direction due to the discovery of the neutrino and phenomenon of parity violation in weak interactions. The neutrino analysis provides this opportunity. The effective cross section of

antineutrinos or neutrinos is extremely small (less than 1 cm^2) that complicates the method of their detection. The neutrinos with high energy is detected relatively easily, as the effective cross section increases sharply in this case. And the opportunity is provided by free space in this method of studying. This opportunity disappears due to the decrease in the volume of free space. Hence, on the one hand, the free space enables to implement the cycle of matter in different scales on a variety of mechanisms. On the other hand, it enables to fix them in various situations.

Based on the above mentioned, it can be concluded that neither substance nor energy disappear, but the cycle of matter is implemented in all cases considered here and in other possible

situations. Their scale (macro, micro), velocities (normal, relativistic) and mechanisms differ. The FSM and its characteristics play a fundamental role in the ECM of different scale, mechanisms and nature.

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MATERİYANIN AZAD HALININ SƏCİYYƏLƏRİ HAQQINDA

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Materiyanın azad halında, fizikada ümumi qəbul olunmuş qaydada, fundamental qarşılıqlı təsir qüvvələrinin mövcud olmaması hipotezasına əsaslanaraq, onun əsas səciyyələri verilir və müzakirə edilir. Aləmin əbədi dövrən paradigması çərçivəsində azad enerji məhfumuna izah verilmişdir. Materiyanın azad halının fiziki və bioloji formalarda təzahür etməsinin mümkün mexanizmləri şərh edilmişdir.

Açar sözlər: aləm, azad hal, əbədi dövrən, informasiya, enerji

О ХАРАКТЕРИСТИКАХ СВОБОДНОГО СОСТОЯНИЯ МАТЕРИИ

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Исходя из гипотезы о том, что в свободном состоянии материи отсутствуют все фундаментальные силы взаимодействия в общепринятом физическом смысле, обсуждаются вопросы о ее основных характеристиках. Дано объяснение понятию свободной энергии в пределах парадигмы вечного круговорота материи. Изложены возможные механизмы проявления свободного состояния материи в ее физических и биологических формах.

Ключевые слова: материя, свободное состояние, вечный круговорот, информация, энергия