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FROM CHAOS TO ORDER AND BIOLOGICAL REALITY (METHODOLOGICAL PROBLEMS)

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Abstract. The present article identifies the structural features of biosystems, presents the transition from chaos to the order of inanimate nature molecules and from it to the biological order, reveals the way of organizing the living. It is methodologically substantiated that the main features of the living are the ability to accumulate energy acquired from outside and striving for the new (mutations) and determination of the living particularity. Life is the result of spontaneous self-organization occurring under favorable conditions in the evolutionary process. To comprehend the subtleties of the evolutionary process, two crucial points should be recognized. The first is that strongly no equilibrium systems become disorganized by precisely microscopic fluctuations, which leads the system to the path of the choice of reactions that are the same from all kinds. Such a change in matter testifies to its internal activity and independence. The ordered matter behavior is just the result of a transition of accidental collisions and unstable compounds. The foregoing means that change is an integral part of the internal activity of self-organization, as an essential attribute of matter. The second is that any evolutionary process of an organized order is the result of changes and development of the surrounding energy-information field. The unusual structure of water determines its amazing physicochemical properties. The high polarity of water molecules (it has one of the largest electric dipole moments among solvents) explains its high dielectric permeability (dielectric constant) as compared to other substances. It is the violation of the water balance in the cell of the body that leads to serious consequences, up to death. A sharp change in water balance leads to pathology. In this regard, the emergence of life is associated with the consolidated environment of the oceans or its regions.

Keywords: chaos, order, bio system, vital activity, energy-information field, matter, cellular mechanism, accumulation, mutation, DNA molecule.

ОТ ХАОСА К ПОРЯДКУ И ОТ НЕГО – К БИОЛОГИЧЕСКОЙ РЕАЛЬНОСТИ (МЕТОДОЛОГИЧЕСКИЕ ПРОБЛЕМЫ)

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Аннотация. В данной статье определены структурные особенности биосистем, представлен переход от хаоса к порядку молекул неживой природы и от него к биологическому порядку, раскрывается способ организации живого. Методологически обосновано, что основными чертами живого являются способность накапливать энергию извне и стремление к новому (мутации) и определение особенностей живого. Жизнь – это результат спонтанной самоорганизации, происходящей при благоприятных условиях эволюционного процесса. Чтобы понять тонкости эволюционного процесса, следует признать два важных момента. Во-первых, никакие равновесные системы дезорганизуются именно из-за микроскопических флуктуаций, что ведет систему на путь выбора реакций, одинаковых для всех видов. Такая перемена в системе свидетельствует о ее внутренней активности и самостоятельности. Упорядоченное поведение материи – это просто результат перехода случайных столкновений и нестабильных соединений. Сказанное означает, что изменение является неотъемлемой частью внутренней деятельности самоорганизации, как неотъемлемый атрибут материи. Во-вторых, любой эволюционный процесс организованного порядка является результатом изменений и развития окружающего энергоинформационного поля. Необычная структура воды определяет ее удивительные физико-химические свойства. Высокая полярность молекул воды (у нее один из самых больших электрических дипольных моментов среди растворителей) объясняет ее высокую диэлектрическую проницаемость (диэлектрическую проницаемость) по сравнению с другими веществами. Именно нарушение водного баланса в клетке организма приводит к серьезным последствиям, вплоть до летального исхода. Резкое изменение водного баланса приводит к патологии. В связи с этим возникновение жизни связано с консолидированной средой Мирового океана или его регионов.

Ключевые слова: хаос, порядок, биосистема, жизнедеятельность, энергоинформационное поле, материя, клеточный механизм, накопление, мутация, молекула ДНК.

INTRODUCTION.

Comprehension of the basics of vital activity is one of the classic problems of modern science which is analyzed in the works of many researchers. And currently, the undying interest of scientists in this problem is explained by its fundamental nature in science, its great penetration capabilities in all areas of theoretical knowledge and forms of social consciousness, the integral content and significance of this problem as a whole.

Life is a biological reality, unlike matter and energy; it is not one of the fundamental properties of the Universe. Most likely, it is a manifestation of certain combinations of mole-

cules which could not exist forever, since even the elements of which it consists had not always existed. The main element of Earth biochemistry is carbon. Its chemical properties are particularly suited to the formation of this type of order of large information-rich molecules which are necessary for constructing genetic ordinal systems with practically unlimited possibilities [19, p. 209-210].

The human mind is inclined to perceive any order in the chaos of numerous data (processes), since human concepts are static and have greater discreteness than the reality that they express. Receiving complex information, the brain must somehow arrange it for its efficient use. An example of this

can be the periodic system by D.I. Mendeleev. The human mind is able to reveal order where it does not exist. For example - constellation. The little man perceives the chaotic arrangement of stars in the sky as an ordered image. In reality, there is neither Great Bear, nor Scorpio, etc., they can be perceived as an accidental set of luminous points. The order is also inherent in complex organizations - living systems [21, p. 406]. The concept of order in more simplified systems, unlike complex ones, manifests itself in simplicity and symmetry, and this sequence can appear both in space and in time. An example of this is the crystal lattice.

It is the reasons for the spatial order that lie in the symmetry of the laws of physics that manage all systems. It is known that physical systems tend to know the position with minimal energy; it is the universal law of nature. If the initial system has an excess of energy (excited state), then all kinds of systems, processes, mechanisms seeking to free the system from this excess, are turned on. That is, sooner or later, the system turns into a state with minimal energy. For this reason, order in space represents a general property of the material world. Such order is due to the spatial order inherent in the laws of physics [15, p. 408].

Let's note that if force gravity would depend not only on the distance between the two bodies (it turned out to be more complicated), but also on their relative orientation, the planets would move in orbits that are not clear to us. Small changes in the physical constants determining the violation of symmetry lead to a qualitatively new Universe in which life would be impossible. For example, if the mass of the proton were more than 0.2%, the protons would decay with the formation of neutrons, leading to instability. Or if the forces of electromagnetic interaction were weaker by 4%, then the existence of hydrogen and stars would be impossible. If the cosmological constant were noticeably larger, the Universe would incredibly swell even before galaxies could form.

For example, if the nuclear force were increased by only a few percent, then all of the hydrogen nuclei in the Universe would be absorbed, and the first half hour of the birth of the Universe, helium nuclei would form, and stars formed subsequently would consist mainly of helium. Helium stars live much less than hydrogen stars. Under such a condition, there would not be enough time for the evolution of life, mind and human being in the Universe. If the nuclear forces were several percent smaller than the existing ones, then the particles of the Universe would not be able to converge in nuclear reactions and would not form such components as carbon atoms which form the basis of life on Earth. The universe would consist only of hydrogen and a little of helium. And then, the life would not be the same today. Firstly, such examples lead to the thought of the existence of parallel Universes [17, p. 22-34] with different values of physical constants, and secondly, they show the significance for the development and establishment of the spatial order of the laws of physics.

METHODS

The space-time order is not only a random feature of the surrounding world. It forms the basis of fundamental physical laws. It is the laws of physics, and not specific physical processes and systems that comprise a striking orderliness. Note that these laws admit an order that manifests itself in space-time simplicity, as well as a special order manifesting itself in a complex organization (biosystem). The same set of laws creates both the spatial form of crystals and a complex one similar to living organisms. It is completely unusual that the simple laws of modern physics provide not only the enormous variety and complexity of the material world, but also extremely complex systems (polymers, DNA, life). The discovery of this kind of order gives rise to a sense of intellectual confidence, a calm faith in the immutability of the laws of nature. Based on the analysis of the main concepts about the origin of life on Earth, a hypothesis is put forward that the laws of physics are based on spatial order and manage all natural systems.

THE RESULTS

The spatial dimensions of bodies are not indifferent to their structure, but rather are a characteristic feature in the reality system. From the order with large molecules of chemical compounds in the parameters of 10-6 cm, they reach for large individuals of plants and animals to the order with parameters of 104 cm. The range is 1010 cm [20, p. 174]. The state of the spatial volume corresponding to the body of the bio-object, regardless of dimension, is asymmetric. This phenomenon is manifested in rightism and leftism, in the inequality of the occurring processes [3, p. 85]. This property of space in the biosphere is inherent only to living organisms. For example, organogenic minerals (oil, coal, humus, etc.) retain the obtained biochemical compounds in which the difference between right and left is clearly expressed, but this property is not restored with a certain geological disturbance. The state of space and time in a living organism can conveniently be called Pasteur's asymmetry. According to the Pasteur-Curie principle, asymmetric phenomena are caused by the same asymmetric cause [9, p. 184].

The main feature of asymmetry, i.e. a special state of space – time which is responsible for life and occupied by its volume, is that the cause-effect relationships observed in the biosphere must correspond to the same asymmetry. The migration of atoms in the process of vital activity from the biosphere to living matter, as well as their reverse process from the cell to the biosphere, occurs in a procedural (indecomposable) context and acts primarily as a planetary process caused by energy, i.e. the radiation of the Sun, responsible for organizing the earth's shell [18, p. 376].

The basis of the World is a single energy-information field, the level of being, where there is no difference between what is and is happening. They are not separable. As a basis for being an energy-information field (with calibrations characteristic of it at each point – vibrations), it can be roughly divided into material reality and non-material reality in a trivial sense: matter and information about it. The pivotal moment of this feature is the fact of the interrelation of these realities.

Information is a way of the presence of energy, or otherwise, energy is informed. Information is an attribute of energy. All available events and processes in nature are nothing but the reproduction of the combination and regularity of specific structures whose material status is determined, accordingly, by informative regulatory principles or simply informational consciousness. The loss of this kind of informational nature is the decomposition or demolition of a world event or process.

From the point of view of the classical world outlook, the results of interaction in nature have unambiguous character. But in real life this is not so. For us, of principal importance is the fact that it is realistic under the given external conditions in a single energy-information space field, the result of the interaction is not uniquely predetermined, it is characterized by a certain degree of probability. A series of such interactions leads to statistics which are characterized by a certain distribution of probabilities. The presence of specific regularities and orderliness, as well as patterns in these interactions, creates objects and processes of the material World.

Rough matter served as a material for processing more finer, more complex forms which in their combination formed higher forms [13, p. 360]. With the transition of matter in the course of evolution into more and more subtle states, forms of matter, such material structures appeared (for example, carbon from which protoplasm is formed) that were the physical basis of life. The process of evolution, acting continuously and constantly, creates an almost infinite variety of animal forms from protoplasm.

The highest manifestation of complex organization in the Universe is life and, therefore, the question is how much our own existence depends on the exact laws of physics [13, p. 273]. Almost any changes in the laws of physics, including insignificant changes in the numerical values of the fundamental constants, would, obviously, completely destroy life

in known forms.

Living systems are inevitably based on the action of physical laws. Here, it can be concluded that living systems are extremely sensitive to the real form of these laws.

This fact of constancy, in decomposability, and indivisibility of information factors from regulatory ones [1; 23, 1974; 12, 1986], finds its fundamental significance in the fact that biological cognition builds its own findings and conclusions on the fact of the existence of such constancy in the world of biosystems. This mutational variability is due to the deeper properties of the cellular system, they make up the specificity (constancy) of the biosystem. Any change in the informative and regulatory factors entails a change in the hereditary properties of the system: $IR = \text{const}$ or $IR = K$. In a differential form, this principle is presented: $d(IV) / dt = K$; $d(IV) = Kdt$, where I is for informational content, R is for regularity, IV is for the amount of informational content of the system.

An elementary change in the informational energy of the system is associated with a change in its amount of informational content. A relation of this kind has the following form: $I1V1 - I2V2 = K\Delta t$.

Thus, impulsivity (mutation) which is based on the rearrangement and deviation of the inherited properties of the system is directly proportional to the change in the amount of informational content of the system. In doing so, such deviations from hereditary properties or, otherwise, novelty, are obtained by recombination of previously obtained information.

An independent need for information serves as self-preservation of a biological object, constancy, as well as the development and improvement of the world of living beings. Just as directed variability, i.e. mutation is necessary for the evolutionary process. This is the act of mastering new areas and new norms of conduct. If living beings strived for their development. Novelty, we repeat, is obtained by recombination of previously received impressions in the process of activity.

Synthesis is the basis for future performing recombination's and, in its turn, creates creativity. The most important feature of living systems is the ability to forecast. A forecast exists for all living things; all living things obey circadian and circular rhythms corresponding to the rotation of the earth around its axis and around the sun, which gives rise to day, night, summer and winter [17, p. 22-34].

Cyclic repeatability in nature allows us to forecast (it was this circumstance that formed the structure of our mind). Consequently, it can be assumed that all kinds of informative-regulatory processes in the cellular system are constructed on cyclicity and circularity which acts as the basis for any vital activity.

Any form of life on Earth is an organization of atoms and molecules, carried out by two acids, RNA and DNA. These acid molecules are composed of long spiral, helical chains of atoms. Over the entire length of such a structure, subunits of only four different types are located at regular intervals for each of two nucleic acids. It is a certain order of arrangement of these subunits along the helix skeleton that simultaneously gives rise to the different life form that we determine.

As the main carrier of genetic information, DNA serves as matter for the synthesis of RNA, on which, in turn, proteins are synthesized. It is possible that RNA was at the source of life on Earth. In those days, it performed a dual function: it served as a genetic matter and as a reproductive apparatus. The special place of RNA in a number of other biological molecules is evidenced by the fact that it, like DNA, can serve as a carrier of genetic information, and in addition, it can accept complex configurations and catalyze biochemical reactions [2].

DISCUSSIONS

From the point of view of organization, all fluent life on our planet can be considered as a competition between the orders of spiral molecules; they are fighting for the possession of a chemical composition. In the process of evolution,

spiral molecules organized chemicals around themselves and, thus, created a permanent protected coating. The spiral molecule has acquired its own area, limited by a membrane (containing the reserves of necessary chemical compounds), inside of which it creates structures to maintain the whole, repairs its various parts and produces materials for the most central spiral molecule. Such an order or organization we call a cell.

The degree of protection of the cellular mechanism is the membrane. It is wrong to say that one person has stronger defense, no matter what he encounters, but another one is weaker. Human being is a late and, obviously, finite organization generated by spiral molecules.

An organism can be strong (highly reactive) with respect to a foreign agent and weak (low reactive) with respect to another one. The ability to respond strongly or weakly to a given agent is not acquired in the process of life, but is inherited, in accordance with Mendel's law. The task is to learn how to transform a genetically weakly reacting degree of protection of an individual into a highly reactive one with respect to a given agent [23, p. 194].

An extremely important question is: How did the first nucleic acids form or appear in the energy-information field of the earth? The exact answer to this question is still unknown. You can only show the fundamentals, directions and conditions for the formation of the system, DNA. One of the reasons for the lack of understanding of this fact by many researchers who are trying to find the exact line between the living and nonliving is the fact that they do not comprehend that the evolution of material structures is in organic interconnection with the evolution of the solar system itself. The organization of new structures became possible due to microscopic fluctuations making up the internal activity of matter. From our point of view, it is trivial that any similar order formed from chaos and is due to the symmetries of the laws of physics. Physical laws admit order, constitute its basis, and manage all systems. Order in space and time can be considered as a general property of the material world. The biological order appears as incredible physical states, it is a transition from molecular activity to the supramolecular order in a cell [11, p.1-48]. Such a transition was facilitated by fluctuations and random elements in unstable systems which led the system to significant changes. Nucleic acids have a past. The molecules forming them are the result of previous evolution. They were selected for participation in autocatalytic mechanisms designed to give rise to very specific forms of organization processes [12, p. 432].

The structures of living objects are formed from simple inorganic and organic substances and have a certain spatial configuration which does not reflect their simple chemical formulas. Relatively simple compounds combine into micromolecules and, finally, into the supramolecular structure that underlies building proteins. For example, Harltd Eray, a chemist from the University of Chicago, is a champion of the original theory of the origin of life on Earth. He believes that a billion years ago, the Earth's atmosphere was composed of methane, ammonia, hydrogen and water vapor. Under the action of lightning or ultraviolet radiation, they split into free radicals, from which more complex molecules formed as a result of random recombination. In this regard, back in 1953, H. Eray, L. Miller assembled a glass unit in which a mixture of methane, ammonia and hydrogen was located above boiling water. As a result, the formed vapors had been circulating in this system for a long time, being exposed to electric charges. As a result, by the end of the day, the water turned pink, it turned dark after a week and became dirty red, amino acids which are elements of protein structures, appeared in it [24].

It is very likely that in the primary elementary life processes the rudiments of information were transmitted not through DNA, but through other molecules. For example, with the help of proteins or even simple metabolites that served as primary genetic material.

However, these primary genetic properties of biological

molecules in their infancy are also found in inorganic nature. So, characterized by a narrow specificity and high activity, biological catalysts - enzymes could develop by complicating inorganic catalysts. For the active centers of each group of enzymes, inorganic catalysts corresponding to them can be found, such as, for example, metal ions for a number of oxidizing enzymes, hydroxyl and hydrogen ions for hydrolysis enzymes. The origins of much more complicated forms of information can be seen in the structure of crystals (especially in a plastic rock of a very specific contour, in which inorganic polymers of silicon compounds can be found). The properties of primary information carriers and interactions with the simplest biosystems also possibly belonged to certain forms of clay or quartz. In the process of evolution, elementary biological structures have turned into more complicated macromolecules of proteins and nucleic acids that underlie the known life forms.

Let's assume that in the initial medium there are small inhomogeneities. Are they the cause of further evolution to the formation of a particular structure? But one thing is definitely established: the instability associated with the mechanism can violate the symmetry of the initial ground state. The ability of the new order to accumulate the information available around itself has generated an action that contributed to the reproduction of itself, an informative consciousness, which, in turn, testifies to the beginning of life.

Scientists have long been studying individual susceptibility to conformational (motor) averaging; there are several theoretical approaches to the most important molecular dynamic simulations which are increasingly used to help experimenters interpret structural biology experiments [5]. The ability of nucleic acids to organize chemicals around them for their own survival (and self-production) in the fight against other nucleic acids is nothing more than the competitiveness of one order of nucleic acid subunits with a different order.

All possible kinds of chemical reactions played a crucial role in the emergence of protein molecular mechanisms, the activity of which is associated with a variety of electrical and wave phenomena, such as electrokinetic phenomena, electrolysis, physical fields, as well as chemical current sources, natural wave processes (sound wavelength range 20-50 Hz), natural electrical systems, various kinds of spontaneous transitions of a solvent into a solution, osmotic phenomena and they contributed to an increase in the amount of informational content of molecules. In this regard, already protein molecular machines turned out to be more informative. In all of these processes, the solvent for organic minerals is water.

The main participants in the evolution were viruses that existed between living and non-living. Any virus consists of a nucleic acid (DNA and RNA) packed in a protein coat. In addition to protective proteins, some of them have viral proteins involved in the infection of the cell. But when the virus enters the cell (after which it becomes the host cell), the picture changes. It discards the protein coat and subjugates the entire cellular apparatus, forcing it to synthesize viral DNA, RNA and viral proteins in accordance with the instructions recorded in its genome.

A living state, into which, under certain conditions, a system consisting of non-living components passes, is defined as some emergent state also containing the building proteins that the virus possesses [24; 10].

Viruses have their own evolutionary history, uprising to the resources of emergence of unicellular organisms. For example, some viral reparations which ensure the removal of incorrect bases from DNA, as well as the destruction of injuries that have occurred under the impact of oxygen radicals, are characteristic of individual viruses that have remained unchanged for billions of years.

During the evolutionary process, close interrelations have been established between biosystems and viruses. The latter, in turn, acted as modifiers of the organism development. The

fact of their long existence implies the existence of a delicate balance between processes that cause deviations. Their absence may have other consequences. Bacteria, viruses and cells of the host organism exchange information with each other in the language of chemical signals. For example, a person and *Helicobacter pylori* (a bacterium causing inflammation of the mucous membrane of the stomach and duodenum, but at the same time protecting the esophagus from serious damage) are closely connected with each other [6]. All livings are organically linked to bacteria, microflora, or viruses determining and influencing the informative and regulatory processes of biological processes.

Viruses are capable of replication not only in living cells, but can also grow in dead cells. It is known that some viruses (guests of organisms) include an enzyme synthesis mechanism restoring damaged molecules of the host cell and returning it to activity. The ability of a virus (cyanophage) to develop in a dead cell, to infect a recently dead cell (a photosynthetic element can bring it back to life), thereby it acts more precisely as a rogenic reformer [7]. Or, in other words, the virus with its basis acts as a living organism from inanimate components.

The difference between biological and biochemical worlds is constantly changing by viruses and energy- informational interaction. As active participants in the evolution process, viruses are closely associated with the genetic and metabolic apparatus of the host cell of all living beings in the process of evolution. The close interconnection of the cell and the virus, their interdependence testify to their single nature of living.

Living organisms contain almost all of the elements of the periodic system. By the set of elements, living and nonliving differs little. All the source material for constructing living molecules is inanimate nature. By the way, seawater by the content of elements (in atomic calculus) with the exception of carbon and phosphorus is very close to the environment of living organisms. Moreover, the chemical composition of seawater is almost identical to that of human blood. Features of water as a solvent are not limited to its individual properties.

CONCLUSIONS

The conducted studies allow us to make conclusion that the first cells or their precursors appeared on our planet several billion years ago in the process of chemical evolution, a process called aerogenesis. Wherever life was born, inanimate matter served as the starting material. Molecules not belonging to the category of biological are simple organic substances and more complex molecules having catalytic properties; they were a part of the system on the way to the living. In a favorable aquatic environment, this system continued to evolve and, in the end, spawned a living cell. From our point of view, at the early stages of evolution, protein enzymes were completely absent and RNA molecules played their role. The prebiological system, consisting of RNA and proteins, gradually changed and acquired the ability of self-replication.

The emergence of this kind of order from chaos (instability and unevenness of the world) is not a random feature of the surrounding energy-information field. Ordered behavior is a transitional result of random collisions of atoms and unstable states, the transition from tiny lumps to complex living organizations as a result of the self-organization process which is based on informative system changes. Change is the internal activity of matter. External motivating force or formation is inherent in matter itself. The formation process is the primary component of the physical field. Being is inseparable from formation. In this concept, order and disorder are complementary, as they form unity. The concept of order is the foundation of basic physical laws. It is the reasons for the spatial order that underlie the laws of physics and manage all natural systems.

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