Canadian Journal of Pure and Applied Sciences
Vol. 12, No. 3, pp. 4651-4659, October 2018
Online ISSN: 1920-3853; Print ISSN: 1715-9997
Available online at www.cjpas.net

Canadian Journal of pure & applied sciences

QUANTUM NONLOCAL BONDS BETWEEN LIVING ORGANISMS AND THEIR ROLE IN EVOLUTION

Firyuza Salikhovna Yanchilina
Newspaper of the scientific community "Poisk", Russian Academy of Sciences, Moscow, Russia
119991, Vavilova, 30/6, Moscow, Russia

ABSTRACT

The article reviews the well-known theories and ideas about the origin of life on Earth. We propose to divide all such theories into two classes. The first include theories and hypotheses that pretend to explain the phenomenal complexity of living beings and their radical difference from inanimate nature. The second class includes theories that do not explain the phenomenal complexity of living beings. One of the unusual and complex phenomena of the subatomic world called the quantum nonlocality is analyzed. The possible influence of this phenomenon on the synthesis of the first organic substances, and subsequently of living organisms, is investigated. The hypothesis of the quantum origin of life is considered, in which the concept of a united quantum state of a living system permeated with nonlocal connections plays the main role. It is shown that this hypothesis belongs to the first class, since it explains the phenomenal complexity of living beings and their radical difference from inanimate nature.

Keywords: Life, origin of life, biomass, united quantum state, quantum uncertainty, quantum nonlocality.

INTRODUCTION

The problem of the origin of life worries not only scientists but also people far from science. How and in what form did the first living beings arise? Did their evolution take place and in what way did this evolution manifest itself? How is life in organisms sustained? There are still no final answers to these questions. None of the known theories about the origin of life provides a complete and comprehensive explanation of the phenomenon of life (Schopf, 2002). However, attempts to understand how living beings have come to be continue.

In October of 2015, it was discovered that when the Earth was a young volcanic planet life already existed on it. Tiny zircon grains have been found in western Australia that were formed when the Earth was only 400 million years old. In one of the 160 grains, researchers found a mixture of carbon isotopes of biological origin aged 4.1 ± 0.01 Ga. If this is the case, the terrestrial biosphere must have arisen about 300 million years earlier than previously thought. This fact gives grounds to the theoretical assertion that different life forms can exist in the Universe, since life could have formed so quickly on our planet (Bell *et al*., 2015).

American and Australian scientists Deamerand, Van Kranendonk, and Djokic believe that life on Earth came not from the sea, but rather from hot, above-ground volcanic pools, seeing as how creating and assembling complex molecules requires energy. Humidification and drying cycles created conditions for the interaction of molecules and natural selection (Van Kranendonk *et al*., 2017).

In March of 2017, Dominic Papineau, a geochemist at University College London, and his student Matthew Dodd described tube like fossils found in an outcrop in Canada (Quebec) that dates to the start of Earth's history. This formation is a fragment of the Earth's ancient ocean floor. Fossils about half the width of a human hair and half a millimeter in length were inside stones. They consist of iron oxide and could be fossilized colonies created by microbial communities 4.28 billion years ago (Dodd *et al*., 2017). Šťovíček *et al*. (2017) studied the microbial community response to hydration-desiccation cycles in desert soil. Such information will help to better understand the problem of the origin of life.

Indian scientists emphasize in their review article on the chemical origin of life that the cooling by seawater of rocks under the ocean's floor could play an important role in the origin of life (Shaik *et al*., 2017). Vitas and Dobovišek (2014) propose a hypothesis that at the origin of life, evolution had to first involve autocatalytic systems, which only subsequently acquired the capacity

Corresponding author e-mail: yafiryuza@yandex.ru

of genetic heredity. The search for evidence of life on the early Earth continues. Such studies introduce corrections into existing theories of the origin of life and require a revision of the pre-existing concepts in this field.

Variety of theories of the origin of life

Let us consider some well-known theories about various scenarios of the origin of life. Almost all of them can be divided into two classes. The first class includes theories that assert that living nature have arisen from non-living matter; this is called "abiogenesis." The second class belongs to theories based on the idea that living matter could only come from something living, the term "biogenesis" is used for this. However there is no explanation of how this "previous living" was formed.

According to most modern models, life on our planet had arisen from 3.8 to 4.1 billion years ago. During this period, the Earth's atmosphere was different than now. Perhaps the composition of the oceans and fresh water pools was very different from the modern ones. According to many scientists, at that time there were all conditions for the emergence of primitive life on our planet (Voet and Voet, 2004).

The Theory of the Spontaneous Generation

According to this theory, living beings are able to arise from non-living matter spontaneously. In ancient Chinese and Indian manuscripts, Egyptian hieroglyphs, cuneiforms of Ancient Babylon, one can find information that various living beings appear from water, mud, rotting matter. People in ancient Egypt believed that, for example, frogs, snakes and even crocodiles were born from a layer of silt on the banks of the Nile after its seasonal spills. Ancient Chinese were convinced that aphids can suddenly occur on young shoots of bamboo. Ancient people believed that all these processes are due to moisture, heat, and sunlight.

Many thinkers of antiquity also adhered to the idea of spontaneous generation of life. For example, Aristotle believed that some particles of matter contain inner strength (entelechy), which under certain conditions can create a living organism. Another ancient Greek philosopher Thales of Miletus believed that life is a property of matter. He believed that everything in the world consists of the smallest particles – atoms. According to his conception, life arises as a result of interaction between the forces of nature, for example, atoms of fire and damp soil.

Later the theory of spontaneous generation was refuted many times. The emergence of Christianity also caused a sharp decline in the popularity of this theory, since it did not accord to the description of the creation of the world in the Old Testament.

Oparin-Haldane Theory (theory of chemical evolution)

The idea of the spontaneous generation of life has found its revival in the theory of the Russian scientist Oparin in 1952. However, this theory differs from the view of ancients by a more scientific, consistent approach. The main idea is the emergence of life from abiotic components. Abiotic components are carbon compounds of pre-biological origin. From this viewpoint, the chemical evolution of organic compounds based on carbon took place before the emergence of life. This chemical evolution was a necessary stage before the emergence of life and thus preceded biological evolution (Oro, 2002). The chemical evolution gradually shifted to a qualitatively new level of biochemical evolution. The British biologist John Haldane also holds the similar views (Bryson, 2003). He believed that pre biotic seas were hot dilute soup, in which living organisms were formed. These compounds were the building blocks for the formation of living organisms. Such ancient sea-soup differed significantly from the modern salt oceans.

According to Oparin's hypothesis, complex chemical changes could spontaneously occur in solutions of high-molecular compounds. This is the so-called "soup" from the hydrocarbons of the primary ocean, which existed in the early planet. More complex organic compounds were formed as a result of such complex chemical changes. As Oparin believed, atmospheric oxygen was not necessary for such processes. On the contrary, oxygen would even prevent the synthesis of organic molecules.

The next step was the formation of the coacervate droplets representing complexes of many organic molecules surrounded by an aqueous membrane. These coacervates were separated from the environment but maintained an exchange with it. They could, for example, absorb substances from outside. If a catalyst appeared in a coacervate droplet, including enzymes, various reactions could occur in it, including polymerization of monomers coming from outside. Such processes had been increasing volume and mass of the droplet. Moreover, droplets were able to split into smaller formations. Thus, coacervates were growing, multiplying, and primitive exchange processes were in them. Coacervate droplets participated in natural selection, that is, in the evolutionary process.

The theory was confirmed in 1953 in an experiment by American scientists Stanley Miller and Harold Urey. A system, consisting of two flasks, connected by tubes, was filled with a gas mixture of methane (CH_4), ammonia (NH_3), hydrogen (H_2) and carbon monoxide (CO). Such a composition, as scientists assumed, was characteristic of early Earth's atmosphere. One flask was half full of water. The second flask was supplied with electric discharges, which simulated lightning on early Earth. In the experiment that was conducted continuously throughout

the week, 10-15 percents of carbon were converted to the form of organic compounds: sugars, lipids, nucleic acid precursors. Two percent of the carbon was found in the amino acids (Lurquin, 2003).

Despite the "material evidence" of Oparin-Haldane theory, it was criticized. One of the reasons was the lack of a single chirality in the amino acids obtained as a result of the experiment. Such amino acids were an equal mixture of stereoisomers of different spatial orientation, which is not typical for amino acids of biological origin, in which only one type of spatial orientation predominates. This ratio prevents further synthesis of complex organic compounds. In addition, American biochemist Shapiro (2007) pointed out that the amino acids in the Miller–Urey experiment had a very simple structure and contained no more than three carbon atoms, while natural amino acids have six or more carbon atoms. It has not been proven that coacervates can become complicated, that is, evolve. Nevertheless, nowadays, disputes about the possibility of spontaneous generation at the earliest stages continue.

Theory of Stationary State

This theory is sometimes called the hypothesis of Eternism (from the Latin word "eternus" that means eternal). It was put forward by the German physiologist Preyer in 1880. According to the theory of stationary state, Earth has always existed. It has always had life. The species of living beings have never arisen, they have existed forever, without being subjected to changes, except insignificant changes. For each species, there could be either a change in numbers, or extinction. The Russian academician Vernadsky, the author of the biosphere theory, supported Preyer's view. He believed that life is eternal because the cosmos is eternal. The hypothesis of a stationary state contradicts the data of modern astronomy, according to which stars have a finite lifetime. This theory does not also correspond to other scientific data, in particular paleontological date. Therefore, it is not considered by modern science and represents only historical and philosophical interest.

Theory of the Origin Of Life in Hot Water

In the 1970s, the Russian scientist Mukhin (Shklovsky, 1976) has expressed his opinion about the possibility of life near submarine volcanoes. Bulgarian scientist Ignatov and Russian scientist Mosin, investigating the spectra of seawater and hot mineral water, came to the conclusion that life could originated in hot mineral water (Ignatov and Mosin, 2013).

In 2011, evidence was found for this assumption in sediments of ancient rocks in Greenland. A scientific group led by Koonin, the National Center for Biotechnology Information of the National Library of Medicine of the National Institutes of Health of the USA in Bethesda, USA, announced the possibility of the emergence of life in freshwater lakes that receive steam and hot water from geothermal sources (Koonin, 2011). The argument in favor of freshwater pools was the assumption that the salt water of the oceans is less favorable for the origin of life. Volcanic heated freshwater lakes fit much more for this. The Nobel laureate Jack Shostak also noted that it is easier to imagine the accumulation of organic compounds in not too large lakes than in the vast ocean.

Panspermia Theory

The founders of this theory are German chemist Justus von Liebig, German physician German Richter, and Swedish physicist, the Nobel laureate Svante Arrhenius. According to this theory, life on Earth could come from outer space (Arrhenius, 1903, 1908). For example, spores, seeds and even protozoa were transferred under pressure of light in space. Getting in new conditions, they had adapted and been multiplying. Transfer of living organisms with meteorites, comets and cosmic dust was also possible. In 2004, during the Stardust mission, NASA's automatic interplanetary station approached the comet Uild-2 at a distance of 240 kilometers; samples of matter from the tail of the comet were collected, where complex hydrocarbon molecules were discovered. These molecules could well serve as building blocks for life. In 2005, in the NASA project "Deep Impact" a 372-kilogram shock module was fired on Comet Tempel 1 that caused an explosion of a five-ton bomb. The metal of the module has evaporated because of the released energy, and a crater with a diameter of 100 meters and with depth of a ten-story building has formed on the comet. The composition of the pulled out substance was studied using a camera installed in the impact module, a carrying part of the probe "Deep Impact" and two space telescopes "Hubble" and "Spitzer". In particular, a mixture of organic and clay particles was discovered from the depth of the comet. Clay particles could act as a catalyst that converts simple organic substances into more complex compounds.

American scientists of the University of Arizona and the University of California at Santa Cruz, exploring the meteorite "CR2 Grave Nunataki 59229", which had been found in 1995 in Antarctica, found that it contained a lot of ammonia – a source of nitrogen for the simplest forms of life. As is known, nitrogen is a part of proteins and DNA, without which life is impossible. This discovery reinforces the hypothesis that the impetus for the emergence of life on Earth could be from outside.

After the discovery of harmful radiation of cosmic radiation for living creatures, the position of the theory of panspermia weakened. Nevertheless, it has been proven that many organisms and spores are resistant to radiation, low temperatures and other extreme effects. However,

there is still no scientific evidence for the theory of panspermia.

In 1973, the Nobel Prize Laureate in Physiology and Medicine Francis Harry Compton Crick and the British chemist Leslie Eleazer Orgel proposed a somewhat different theory of controlled panspermia, according to which microorganisms had come to Earth by an alien civilization spacecraft (Crick, 1981). The reason for this could be a global catastrophe on their home planet and a desire to save life. According to another version, such a transfer was carried out for future colonization, it was necessary for this to carry out preliminary terraforming with the help of these microorganisms (that is, creation of the necessary climatic and ecological conditions on a new planet). Opponents of panspermia theory indicate that this theory does not solve the issue of the origin of life, since it is unclear how it had been formed on other planets (Thomas *et al*., 2006).

Creationism

These are theological concepts, mainly of the Abrahamic religions, according to which Earth, the world as a whole, and also life on our planet, including mankind, were created by God. In Judaism, Christianity and Islam, the dogma of the Old Testament (the Pentateuch of Moses) is used, a description of creation of the world. Creationism was not accepted by the scientific world because of the lack of evidence base.

Not all existing religions explain the origin of the world and life. For example, according to Buddhism, worlds constantly appear, change, collapse and disappear, continuing the endless cycle. According to the Buddha, the desire to know about such things is a waste of time, since the goal of a person's life is to be free from suffering (Bodhi, 1978).

Darwin's Theory of Evolution

This is one of the most popular theories relating to life on Earth. According to this theory, all living beings on this planet were not created by anyone; they appeared naturally due to the laws of nature.

Darwin believed that life had begun in a warm little pond with all the necessary substances and heat. Gradually, protein compounds appeared. Organic forms had slowly been changed, that is, they had been evolved adapting to the conditions of the environment. Heredity, variability and the continually occurring natural selection, which can also be called the struggle for existence, are at the heart of transformation of species. Natural selection occurs through the complex interaction of living organisms with each other and the environment. The result of such an evolution is the fitness of living beings to their living conditions and the variety of species in nature. Darwin's ideas inspired scientists to actively research in the field of ecology and genetics, and also contributed to the development of atheism.

Modern Ideas about the Origin of Life

One of the main problems that worries modern scientists is what was primary – proteins or genetic code. Depending on this, two approaches are distinguished: genobiosis and holobiosis. Genobiosis implies the primacy of the molecular system with the properties of the primary genetic code. Golobioz is based on the idea of the primacy of structures with the properties of elementary metabolism with the help of enzymes.

Hypothesis of the RNA World

There is a version that the first living creatures were RNA organisms, without proteins and DNA. That is, the RNA world was possible, it is a hypothetical stage in the emergence of life, when life on early Earth had consisted only of ribonucleic acids that had been storing genetic information and had been participating independently in the replication processes without the participation of proteins.

The American microbiologist Karl Woese has first expressed the idea of the RNA world in 1968 (Woese, 1967). Afterward, the British chemist Leslie Orgel has developed it in 1968 and finally the American scientist, Nobel laureate Walter Gilbert has formulated this idea in 1986 (Gilbert, 1986). Subsequently, a modern DNA-RNA-protein life had emerged from the RNA associations separated by a membrane from the external environment.

But how had the first RNAs arisen? As a version, the possibility of the appearance of RNA-like chains by evolution from polycyclic aromatic hydrocarbons is suggested.

The world of polyaromatic hydrocarbons is a hypothetical stage of chemical evolution, when polycyclic aromatic hydrocarbons in the primary soap of early Earth led to the synthesis of RNA molecules. Simon Nicholas Platts has first expressed this hypothesis in May 2004. A group of scientists has published a more complete, developed idea in 2006 (Ehrenfreund *et al*., 2006).

Two Classes of Theories of the Origin of Life

As noted above, none of the existing theories explain the essence of life and the cause of its origin. They do not explain why living organisms are fundamentally different from inanimate objects. In this regard, I propose to divide all theories and hypotheses about the origin of life into two classes. The first class includes hypotheses that try to explain the phenomenal complexity of living beings, their radical difference from inanimate nature. The second class includes theories and hypotheses, which relate only to the history of the emergence and evolution of life and

do not pretend to describe the phenomenal complexity of living beings.

Only that theory of the emergence of life can pretend a solution to the problem that explains the phenomenon of complexity and continuous complication of life on Earth. The lack of such an explanation leads to the fact that people and even scientific researchers will continue to believe in the Creator, which created all things. Thus, a deadlock is formed in the scientific understanding of the issue.

In this paper, we will consider the hypothesis about the origin of life, in which an attempt is made to reveal the complexity of living beings and which can be attributed to the hypothesis of the first class. This hypothesis examines the quantum processes that take place everywhere and permeate our world. Perhaps they played the decisive role in the process of the origin of life and its evolution. The author has considered the hypothesis of the emergence of consciousness in (Yanchilina, 2018).

Before moving on to the quantum hypothesis of the origin of life, I will tell a bit of the "illogical" phenomenon of the quantum world. The recent work by Gisin (2015) treats the long history of nonlocality in science focusing on the achievements during the last years. Gisin mentions that Newton, the creator of the Universal Theory of Gravitation was not happy with his theory due to the following inconveniency that follows from his theory: a moving stone on Moon's surface will immediately change the weight of anyone here on Earth. So, this is an example of the classical Newtonian nonlocality. With absence of any alternative theory, science was remaining nonlocal approximately up to 1915 when Einstein created his Special Theory of Relativity that introduced the locality in science due to the limitation on the speed of light for signals. However, already in 10 years, namely in 1925 the quantum mechanics was created and has introduced quantum nonlocality because information (signals) can be instantaneously transferred between two quantum particles being at astronomic distances from each other. Today it is stated that the majority of the scientific community already accepts the quantum nonlocality. However, the recent theory by Zakharenko (2016, 2017) can support the minority of the scientific community in the direction of the classical locality in science. Zakharenko (2018) discusses that signals can be transferred at speeds thirteen orders faster than the speed of light in a vacuum that can be used for the instantaneous interplanetary communications.

Quantum Nonlocality: Einstein's "Spooky action at a distance"

Along with "quantum nonlocality", the term "quantum entanglement" also exists. Both terms imply the same phenomenon but different aspects. Quantum entanglement means a quantum mechanical phenomenon, in which the quantum states of two or more particles are related to each other and described by a common wave function with nonseparable variables. The wave equation for such a set of particles describes a connected state, and it cannot be reduced to the sum of the wave equations of each individual particle. This means that measurement (measurement in quantum mechanics means interaction with a classical object) done over one particle, has an instant effect on all other particles that can be at a great distance. Such an instantaneous action at a distance is called quantum nonlocality or simply nonlocality. These effects were first discussed in the Einstein-Podolsky-Rosen thought experiment (Shimony, 1988; Horgan, 1992). With this experiment, Einstein tried to convince Bohr that quantum mechanics is either incomplete or non-local. Einstein did not believe in the possibility of such an almost mystical phenomenon as nonlocality, so he considered quantum mechanics not a complete theory. The phenomenon of nonlocality and the Einstein-Podolsky-Rosen experiment are considered in detail in the monograph (Yanchilin, 2010).

Later, numerous experiments were carried out to measure the polarization of pairs of photons of common origin. These experiments showed that a nonlocality really exists in the behavior of quantum entities. The measurement of the polarization of one photon instantaneously changed the state of another photon. Namely, the second photon from the state with an indefinite polarization instantaneously passed into a state with a certain polarization. Gradually, the experiments became more accurate, and the distance between quantum entities increased. In 2008, Swiss scientists at the University of Geneva have conducted an experiment using two streams of entangled photons separated by 18 kilometers (Salart *et al*., 2008). According to this experiment, the nonlocal interaction between quanta occurred at a speed of at least 100,000 times the speed of light. It should be emphasized that, according to quantum mechanics, nonlocal interaction occurs instantaneously. Researchers from the Austrian Institute of Quantum Optics and Quantum Information have conducted an experiment, in which interconnected photons were separated by 144 kilometers, this occurred between laboratories on the islands of Palma and Tenerife (Scheidl *et al*., 2010). The existence of the nonlocality and quantum entanglement in our world at distances greater than 100 kilometers was confirmed in this experiment.

It turns out that the particles at great distances from each other "feel" each other. Measurements conducted on a single photon instantly changed the state of the other one. According to quantum mechanics, this is because quantum entities connected by nonlocal bonds are a single whole and react to external influences as a single whole.

It was also proved that not only "weightless" photons, but also particles that have a mass, exhibit the property of nonlocality. In 2010, an international team of scientists from France, Germany and Spain confirmed the existence of entangled quantum states of electrons in a solid superconductor of carbon nanotubes (Herrmann *et al*., 2010). In 2011, researchers from the Max Planck Institute for Quantum Optics have created a state of quantum entanglement between an individual rubidium atom and a Bose-Einstein condensate spaced 30 meter apart (Lettner *et al*., 2011). In 2015, a group of scientists led by Professor Ronald Hanson from Delft University of Technology in the Netherlands have conducted an experiment, in which two electrons separated by 1.3 kilometers at the Delft University campus, showed a nonlocal relationship, Eintein's "spooky action at a distance" was again confirmed (Hensen, 2015). So, the nonlocality (quantum entanglement) really exists and is proved in numerous experiments.

Taking into account the unusual quantum phenomenon of nonlocality, it is possible to examine how the nonlocality can affect the processes that had been taking place in the distant past and resulted in the development of civilization. We will consider the hypothesis of the quantum origin of life.

Quantum Hypothesis of the Origin of Life

It is possible to state that a quantum motion is much more complex and diverse than a classical motion. Let us consider this with the example of the quantum motion of an electron. The electron moves in the form of an electron cloud, that is, a wave packet. While the path of this particle is free it, moving constantly, increases in size. Suppose a particle encounters an obstacle. There may be different scenarios for its future behavior. The first option: a wave packet of a particle can bounce off an obstacle (macro object) and continue its movement, but in a different direction. The second option: the wave packet can collapse and the electron will turn into a point. The third option: the electron is split into two (or more) wave packets. These split wave packets will move in different directions. The most interesting thing is that the electron can bounce off an obstacle and bypass it from both sides simultaneously.

So, the wave packet of the electron after encountering an obstacle will be divided into two (or more) packets. In this case, we will have not two electrons. We will have a single electron. This particle will consist of two spatially separated parts. Separated wave packets can further be divided into parts. In this case, an electron will no longer consist of two parts, but, for example, of four or more parts.

As an example, we can remember the dumbbell form of the *p*-electron in an atom. The electron, as it were, consists of two parts, that is of two halves of a dumbbell. However these are no two electrons because the single electron having wave properties is simultaneously in two halves of a dumbbell.

When moving, wave packets are spreading. Their form also changes. After a while, an electron (if it not collapses to a point) will exist in the form of a huge number of wave packets of different sizes and bizarre shapes.

These wave packets can move at different speeds in different directions. In addition, in the interaction of wave packets with macro objects, some of wave packets can not only change their shape. They can also collapse and eventually disappear. In this case, not a wave packet as a part of a divided electron consisting of a large number of wave packets will disappear. The entire variety of electron wave packets will disappear. This variety will turn into a dot in the spot where a collision of some wave packet of an electron with a macro object occurred. This is an example of the famous quantum leap. Thus, a single moving electron due to its quantum properties can be a very complex object constantly changing in time.

If we consider a lot of quantum entities connected by nonlocal bonds, we get an incredibly complex pattern of the motion, the complexity of which exponentially increases with time due to the appearance of new nonlocal bonds. Under ordinary conditions, quantum entities constantly interact with classical objects. Sometimes the collapse of their quantum states occurs, and almost all information contained in this system is lost.

Living beings store a lot of information in themselves. It is logical to assume that this information can be stored in a very complex quantum state of elementary particles, of which living beings are composed. The quantum state of one elementary particle can be very complex and contain immense amount of information. The quantum state of a living organism that consists of a huge number of elementary particles is incomparably more complicated.

Any living being is very different from inanimate matter. At first glance, both living and inanimate objects consist of identical elementary particles – protons, neutrons, and electrons. Nevertheless, the difference between living being and non-living thing is cardinal. To explain a reason for this difference, the Russian physicist Vasily Yanchilin put forward the hypothesis that elementary particles that make up a living organism are in a very complex quantum state. For example, an elementary particle, falling into a living organism, can be divided into a multitude of wave packets that will then move in a living organism forming a single whole. He suggested that some part of elementary particles of a living organism is not localized in certain spots of this organism, but moves in the form of wave packets throughout this organism. We can say that a

living organism is very complex processes between quantum entities connected by nonlocal connections. The outer shell of an organism protects these processes from the surrounding world, allowing quantum states to become more complicated (Yanchilin, 2008).

According to this hypothesis, at the earliest stage of the emergence of complex organic compounds, all of them were in a united quantum state, that is, in nonlocal interaction between themselves. This state with quantum entanglement, we will call the quantum Biomass or simply Biomass. Due to a united quantum state, the processes that took place in the complex molecular formations that formed within Biomass were determined by the entire Biomass. Biomass, as a single formation, influenced its own parts thanks to nonlocal bonds and thus promoted the growth of complex molecular formations within itself. The influence of a complex quantum state of Biomass on its parts led to the growing and complicating these parts. This, in turn, led to the complication of the entire Biomass. As a result of this positive feedback within the Biomass, complex molecular formations had been formed.

The complex quantum state of molecular structures reflected almost all of their evolution, which lasted many hundreds of millions of years. Atoms and molecules that made up these structures were in a single quantum state with all other atoms and molecules of the Biomass.

As Biomass became more complex, it became more and more separated from the rest of the world. This led to the fact that molecular formations within it also became more complex and they were increasingly separating from each other. Their development to some extent repeated the development of the entire Biomass. However, Biomass continued to be a single whole at a quantum level. Finally, the following thing had happened. Inside itself, Biomass was divided spatially into many parts – unicellular formations, ancestors of modern bacteria. But, despite such a spatial division, all parts of Biomass continued to be a single whole at the quantum level.

This is the way how first living beings had appeared on Earth. From this viewpoint, all living beings are connected with each other by nonlocal bonds at the quantum level. The incredible complexity in the behavior and structure of living beings is due to the fact that they have a very complex quantum state that became more complicated during billions of years (Yanchilin, 2008).

The unity of all living organisms at the quantum level explains instincts. These are a kind of adaptation mechanisms during situations that have been repeated many times during the evolution of Biomass. The correct behavior of the constituents of Biomass was most favorable for the conservation and development of living beings. Thus, a certain behavior (instinct) was recorded in the "database" of Biomass at the quantum level.

Additional Questions

Can a person live without Biomass? For example, let astronauts are flying somewhere far from Earth. At this time, a catastrophe has occurred on Earth and all living things have died. This will probably lead to the death of astronauts even in spite of the fact that they are far away from their native planet. This is a consequence of quantum nonlocality when something that happens in some part of a quantum-bound system is reflected in all the other parts of it. All parts and elements of Biomass are connected by nonlocal bonds. Astronauts, as a part of Biomass, are also connected with it by nonlocal bonds.

Can we write down mathematically the complex quantum state of Biomass or at least of some of its parts: living organisms or at least ordinary molecules? Quantum mechanics is the complex science difficult to understand even for scientists. It operates with probability functions. It is not possible to describe even the simplest state of an organic molecule, especially in connection with Biomass. But this is not ruled out in the future. The laws of quantum mechanics are increasingly being used in engineering and science. Quantum computers based on the phenomena of quantum entanglement are created. Quantum computers in the future will be able to make incredible calculations, including calculating the probabilistic quantum states of living beings and even the entire Biomass.

When did life go to dry land? This had also been happening gradually. Variable external conditions, including geological ones, had been changing Biomass. It was being become more complicated, adapting itself to external conditions. Living beings of Biomass were also varying adapting to new conditions. Some part of them had remained in the ocean, and another part that located on the land began to change and become more complicated taking into account these external changes. As a result, Biomass did not break up into parts, according to the criteria of water and land. It continued to be the single whole. However, parts that were in different environments (water and land) continued to develop, in slightly different directions.

CONCLUSION

Living organisms are fundamentally different from inanimate objects. They are able to be born, die, evolve, feed, move, struggle for existence. They have instincts and reflexes. None of the previous theories of the origin of life explain these unique features and possibilities of living organisms. The hypothesis of the quantum origin of life explains all these phenomena using a united quantum

state of Biomass, which stores the entire history of the development of Biomass and its living organisms.

The connection of each organism with Biomass gives vitality to a living being, allows it to use knowledge from the "database" of Biomass, which is expressed by a complex united quantum state. The detachment of a living organism from Biomass can lead to serious illness or death. That is why all living beings can live and evolve being in continuous and direct connection with all other living nature. Developing a quantum-nonlocal approach to the phenomenon of the origin and development of life, we will be able answer many questions of biology, biophysics, biochemistry, astrobiology, which until now remained unexplained.

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Received: July 26, 2018; Accepted: September 29, 2018

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