

Role of Bose-Einstein Condensate and Bioplasma in Shaping Consciousness

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ABSTRACT

Quantum mechanics is capable of contributing to the development of psychological knowledge by creating new models to explain the mechanism of perception as well as the nature of mental processes. This knowledge will in turn facilitate the combination of electronic and information systems with the human biological system in robots. Such an arrangement, in the form of mutually coupled systems, can contribute to humans' becoming considerably more intelligent, acquiring better social skills, developing a universal management system, being provided with a wide range of language learning opportunities etc. It will pave the way for new educational systems, based on quantum computer science and artificial intelligence. In an electronic model of life, the biological system is understood to be a system composed of piezoelectric and pyroelectric devices, protein semiconductors, nucleic acids and melanin. In this system control is effected through a network of electron, photon, phonon, spin and soliton information channels as well as bioplasma. Each of these channels can in itself be a carrier of information, or they can function collectively as a group in the bioplasma system.

Key Words: bioelectronic processes, bioplasma, Bose-Einstein condensate, biocomputer, consciousness

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1. Bose-Einstein condensate and the part it plays in creating consciousness

In 1924, Sir Jagadish Chandra Bose predicted that in certain extraordinary circumstances numerous particles might be aligned in a "uniform manner, ordering, e.g., spin axes "upwards". Such synchronization of particle spins can produce such phenomena as superfluidity, superconductivity and emission of polarized light (laser). In his book *The Quantum Self (1991)*, Danah Zohar put forward a thesis that Bose-Einstein condensates not only behave as a whole, they become whole, as the many voices of a choir that merge to become one single voice make up

the whole composition of singing. If you stimulate a Bose-Einstein condensate with light, the bosons will emit polarized light.

All physical particles, not only elementary ones but also complex atoms or molecules, can be classified according to whether or not wave functions are symmetrical with respect to an exchange of two particles in a set. Particles whose wave functions are symmetrical are known as bosons and those that have anti-symmetric functions are called fermions. Whether or not a given object is a fermion or a boson is determined by its angular momentum. Reference is here made to total angular momentum which, in relation to

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composite particles, is the sum of the spins of all the components. Bosons have integer spins, so they equal 0, 1, 2, while fermions have half-integer spins, that is, 1/2, 3/2, 5/2, ... (expressed in terms of Planck's constant). The most important consequences of this classification become apparent when these particles have quantum properties – i.e. they behave as waves of matter. Atoms are either fermions or bosons, depending on their mass number (the total number of electrons and nuclei (Domanski, 2010).

By using an optical device such as a laser, it is possible to slow down (cool) atoms. In respect of atoms in the gas phase, where there are various directions of atom movement, illumination with laser light may result in global atom movement. This is a mechanism for slowing down the movement of atoms or cooling of gas. Thus, at the expense of its kinetic energy, an atom emits more light energy than it absorbs, and gradually reduces its speed, and therefore the gas cools (Szczepkowski *et al.*, 2009).

In a Bose-Einstein condensate quantum processes exhibit a high degree of orderly arrangement and of unity. Each particle in a Bose-Einstein condensate fills all the space, all the time, and regardless of various impacts such particles behave holistically as one particle. A key feature of Bose-Einstein condensates is that particles which make up an ordered system will not only act as a whole, but will also “care” for such an order, and there will not be any interference between individual particles. The particles do not lose their individuality within the whole. Condensates are described with a single wave function. This means that the entire object has one solid phase. A number of important experiments using Bose-Einstein condensates have been carried out. The wave-like nature of condensates (Esslinger *et al.*, 2000; Bloch *et al.*, 2000; Ritter *et al.*, 2009; Kohl *et al.*, 2005) has been demonstrated; and interference between two independent condensates has been observed (Andrews *et al.*, 1997; Alekseev, 1999; Dziarmaga and Karkuszewski, 2003). Vortices have been shown to exist in condensates (Matthews *et al.*, 1999).

Numerous analogies have been observed in relation to non-linear optics as the existence of dark and bright solitons (Burger *et al.*, 1999; Khaykovich *et al.*, 2002; Dziarmaga, 2004; Carr and Clark, 2006; Matuszewski *et al.*, 2005). It was noticed that a soliton can generate an electromagnetic wave, or swallow it, which

contributes to the creation of conductive continuum and transmission of information over long distances (Salasnich *et al.*, 2002; Muryshev *et al.*, 2002; Burger *et al.*, 1999; Denschlag *et al.*, 2000; Bongs *et al.*, 2003), and to the mixing of four waves (Deng *et al.*, 1999; Hagley *et al.*, 1999; Simsarian *et al.*, 2000).

The Josephson effect has been observed (Cataliotti *et al.*, 2001; Burger *et al.*, 1999). A molecular condensate and a condensate of Cooper pairs have also been created (Regal *et al.*, 2004). Domański (2010) in his lectures proposes the presence of BEC of magnons. Elementary excitations in magnetic materials (so-called magnons) obey boson statistics due to total spin. If the life of these quasiparticles is sufficiently long, this enables coherent BEC condensation of magnons to occur. This phenomenon is manifested by: spin supercurrent - transport of magnetization, Josephson effect - interference of condensates, critical current, quantum vortices – used to model de Witten’s cosmic strings. If we were to regard Domański’s scientific theses as true, we would need to accept that melanin and neuromelanin, whose function is to control spins in free radicals, can contribute to the formation of Bose-Einstein condensates of magnons. Studies have shown the ability of a Bose-Einstein condensate to condense at room temperature within an organic polymer (Plumhof *et al.*, 2014; Stöferle *et al.*, 2015) as well as the occurrence of magnon pumping in Bose-Einstein condensates at ambient conditions. Bose-Einstein condensation can also take the form of “macroscopic quantum coherence”.

The 1968 theory of Herbert Fröhlich assumes that nerve cells have the ability to create a Bose-Einstein condensate. Fröhlich is of the opinion that a large number of quanta can condense into a single state called a Bose-Einstein condensate. This status allows for communication over long distances and for correlation between dipoles. Fröhlich concludes that the condensate phenomenon occurs along the actin filament line (part of the cytoskeleton), creating the quantum coherence of waves which are responsible for the formation of consciousness (Fröhlich, 1968).

In 1967, Horoomi Umezawa and Luigi Maria Ricciardi proposed a model of consciousness based on quantum field theory (QFT). This model draws on Fröhlich’s publications about Bose-Einstein condensates. According to Umezawa, consciousness is the result

of the sum of quantum processes, with the role of the nervous system being limited to transmitting macroscopic signals; it is Bose-Einstein condensates that are responsible for the stability and consistency of consciousness.

One of the major supporters of the quantum theory of consciousness is the contemporary British physicist Roger Penrose. In his opinion, consciousness must be a quantum phenomenon, because ions are too big and biochemical processes are too slow to quickly provide information to cells. Inside a neuron there is a "cytoskeleton" which provides cell structure. The cytoskeleton consists of "micro-tubules" with a diameter of 25 nanometres. Penrose believes that consciousness is a manifestation of quantum operations of the cytoskeleton and of the links between quantum and classical levels of cell activity. Penrose's theory is similar to a theory propounded by the American psychologist Stuart Hameroff. Microtubules are composed of subunits: proteins and tubulin dimers. Dimers of tubulin have hydrophobic pockets that are 8 nm apart from each other. They affect the delocalization of "pi" electrons. Tubulins include polar regions, rich in "pi" electrons, separated from each other by about 2 nm. Hameroff proposes that these electrons are sufficiently close and are able to start quantum processes by forming a state known as a Bose-Einstein condensate. According to Hameroff, this phenomenon not only takes place within a single cell, but it also extends to other nodes located in synaptic slots, thus forming a macroscopic quantum function across the whole brain. Hameroff postulates that the activity of these condensates is the source of gamma wave synchronization in the brain, and a consistent feature of consciousness (Hameroff, 1982; 1987; 1989; 1990; 1994; 2006).

2. Biophoton emission in a biological system

All organisms, ranging from bacteria to human beings, constantly emit extremely low-intensity light, in the range of 200-800 nanometres, referred to as biophotons or ultra-weak biochemical luminescence. Such light corresponds, for the most part, to the visible electromagnetic spectrum, but also partly overlaps ultraviolet and infrared radiation. So the processes of life and light are inseparably inter-related, because of the same electromagnetic nature. Light performs essential roles:

information, energy and regulatory roles in living organisms in the ecosystem, e.g. in photosynthesis, vision, and biological rhythms etc. However, the information and regulating role of very low-intensity light is less understood than the energy-imparting role for biological systems. Therefore, scientists do not evaluate or use information potential, if any, in biogenic radiations (Sławiński, 1990).

According to Sławiński and Popp, biogenic radiation is a very weak radiation. A single living cell, for example a yeast cell, or a white blood cell (leukocyte) emits an average of one photon per minute. So the probability of photon emission by a healthy and living cell or an organism is extremely low. It seems that light generation processes are strictly controlled and reduced to a minimum. The human organ of vision, or the eye - brain, is not capable of detecting such dim light under normal conditions. In order to measure such low-intensity light special optoelectronic, ultrasensitive devices need to be used. In a healthy, normally functioning body, at the lowest, constant intensity (I) and fixed frequency (N) or the wavelength λ of the scale of the spectrum, these processes are stabilized. These parameters will change in medical disorders - biophoton light emissions and their frequency are increased. It should be concluded that ultra-weak light signals can serve as a communication channel between cells, tissues, organs and the whole biological system (Sławiński, 2003; Popp, 1979; 1983; 1992).

Life and consciousness exhibit characteristics of an electromagnetic field. At death, biological matter, having exhausted all adaptive reserves of a living system, has light separated from it. Such matter remains organic, but is abiotic. Both components of life proceed to their natural conclusion - matter re-enters the chemical elements cycle, while the other component, which is light, chooses space (Sedlak, 1987: 111).

Watson and Crick published their paper on the helical structure of deoxyribonucleic acid in 1953. After the discovery of the genetic code, it was quite quickly established that all known life forms contain a "recipe", included in the code in the form of complex sequences of biochemical reactions. This blueprint in the genetic code determines the structure and function of organisms, as well as the development of specific forms of life at a given stage of development and the way they reproduce. It seems that life came



into existence when such a blueprint was created containing specific genotype and phenotype patterns, patterns for perception of the world, for responding to stimuli, styles of behaviour, manner of thinking, etc. All information about the human body is to be found in half of all *X* and *Y* sperm (i.e. those that contain an *X* or a *Y* chromosome; each female oocyte contains complete information about the genotype and phenotype of the human being, and a human being can be recreated by using the 'cloning' technique (Muc-Wierzgoń *et al.*, 2001).

All doctors are aware that at the end of life, human mental resources are greatly reduced. In old age, certain diseases are accompanied by "consciousness" being significantly diminished or even lost. What would one have to do at this point of one's life in order to be as fully aware of oneself as in one's youth? One would have to have access to an earlier version of the recipe for one's body which recipe, however, has already disappeared. One's nervous system would have to be rebuilt according to such a blueprint, and the brain would have to have the original information input in it and a programme would have to be run to implement one's development. Then one would be able to say, "I'm now what I used to be in my youth". An important role in this process would be played not only by the recipe for one's body, but also by the carrier of information - or events taking place in one's life.

Let us analyse this issue from the perspective of a computer and its information simulation. It is an interesting case! Organized information always needs material support. An information carrier can be an electromagnetic wave, an acoustic soliton, a spin wave and a bioplasma wave. Numerous computer programs contain different instructions. The computer that defeated chess champion *Garry Kasparov* had a set of program instructions that had been entered into its memory by the individuals preparing this computer for operation. This collection of information is intangible, but it needs a material carrier - a processor, neurons, the brain, floppy disks, pen-drives, etc.

The clinical death of an organism causes a weak signal to be sent to hyperspace. The bioelectric activity of the heart and brain manifests itself by electromagnetic waves. The cessation of electromagnetic wave transmission by an organism can be detected using medical equipment, but there is also a weaker signal which

comes from genes, recorded in the DNA code, which terminate communication with life transmutation patterns. The signal is probably soliton, spin and bioplasma waves. In order to append a message to these first two weak signals it is necessary to use a transmitter, one that transmits on Bohm wavelength, Bose-Einstein condensate and bioplasma wavelength. Such a transmitter can be created by a "group of persons" who, because of a certain psychological motivation, decide to synchronously connect their Bose-Einstein condensates and bioplasma on an interference basis and become a carrier transmitting information to hyperspace. Bringing together a large number of people provides conditions for obtaining a coherent "wave function" in a macroscopic coherent Bose-Einstein condensate which is a type of a transmitter-receiver system outside space-time (Deutsch and Lookwood, 1994).

Coherent wave functions are not subject to the principle of locality. They are part of the so-called hidden order of the universe. These wave functions can establish a kind of communication with that hidden order and can determine whether or not a given item of information is sent to space-time. So one can assume that neuronal microtubules and DNA of our brain also handle waves other than electromagnetic waves, the waves to which the Einstein-Podolsky-Rosen argument applies, or waves that are not subject to the principle of locality. These are the waves that lie in the so-called Hilbert configuration space, "superimposed" on space-time.

David Bohm has demonstrated a break-up of a particle with zero spin into two particles with spin - for example, an electron and a positron. These particles fly in opposite directions, they reach points A and B that are spaced a certain distance apart. John Bell devised his famous theorem which claims that the predictions of quantum mechanics on cumulative probability of particle spins measurements at these points A and B are contrary to the assumption of local realism, that is, the assumption that the electron at point A and a positron at point B are two independent objects. The adoption of such a hypothesis leads to the conclusion that the cumulative probability of obtaining various measurements of A and B is different than that given by quantum mechanics. Bell's theorem is of significant theoretical importance for science; subsequent measurements, especially those carried out by Alain Aspect in Paris, show that non-local effects



have no counterpart at the level of classical physics (Bohm, 1980; Bohm and Pribram, 2003; Bohm and Hiley, 1984; 1993).

In addition to the state of “existence” and “non-existence” there is a third state that is intermediate between two existing particles. A particle, in fact, may be in a certain region of space or may not be there or it is in an undefined position (Heisenberg, 1927). Ingarden (2000) believes that open systems in quantum physics are represented as objects in the sense of quantum logic, but in macrophysics they are usually described by classical logic and mathematics in the form of Boolean algebra and theory. This is an improper implementation, as classic logic and mathematics refer to closed rather than open systems. In the 60s of the last century a tool was invented for open sets, i.e. a fuzzy sets theory was developed (Kaufmann, 1972; Drewniak, 1984).

When investigating the nature of consciousness, quantum logic should be a basic research tool, because it takes into account an entangled state of two quanta that cannot be reduced to a description of individual quantum states. Bell's theorem means that at the subatomic level, various components of the universe are connected by a direct and immediate relationship independent of time and space. One can conclude that this relationship can be applied to the functioning of human consciousness, which works with the Cosmos. Consciousness can follow the laws of quantum mechanics, and can exist in a certain region of space, or it might not be there or its location is undetermined. That indeterminacy is significantly different from existence and non-existence, it is self-organizing, without time and without a spatial dimension (Ingarden, 2000; 2001; 2002).

Our bodies exist in reality, but are not made of passive matter, they are relevant complex sets of information received via the brain as real bodies of specific individuals. Microscopic systems, consisting of several or more interacting particles, exhibit a characteristic such that the superposition of the possibility of such a system is usually very complicated. Quantum theory claims, and experience confirms, that individual particles of a system cannot be assigned their own possibility superpositions, because they subsist in a complex relationship with possibility superpositions of other particles, even if they move away from each other over long distances. Such relationships are called correlations. When a

particle, after a measurement has been made, is observed in a certain region of space, this causes an immediate change (propagating at a speed greater than the speed of light, and maybe even an infinite speed) in the superposition possibility of all the particles correlated with the particle observed. This refers to a mysterious, yet extremely important feature of quantum theory, i.e. its non-locality (Jacyna-Onyszkiewicz, 1999; 2008). This non-locality can be a major attribute of consciousness and its deeper understanding presents a challenge for science in the coming years.

3. The role of bioplasma in the process of functioning of consciousness

Sedlak acknowledges that bioplasma is an integrating factor in a biological system, while Penrose, Hameroff, Fröhlich, Zohar and others are of the opinion that it is Bose-Einstein condensates that are responsible for the consistency of a biosystem. Bioplasma is a state in which fields and particles with positive and negative charges are connected to each other in an organic semiconductor, interacting with each other. Bioplasma is to be found in protein semiconductors, piezoelectric or organic compounds. In order for charged particles and excited states to exist both in plasma and in the body, it is necessary to provide energy in various forms. In the first case, it is accomplished physically by providing external energy that is received by the human senses. In the other case, energy is provided via a chemical process – by chemical energy being released through metabolic processes. Bioplasma dies off due to the loss of energy as it is emitted. The ageing of an organism is the result of destabilization of bioplasma expressed through the disappearance of the plasma state. Bioplasma is a material centre of life and an underlying layer of consciousness. It constitutes a whole within the body. Bioplasma attributes include not only electrical and magnetic symmetry but also the symmetry of subsistence and annihilation as well as degradation and generation. Plasma does not subsist, it is created and disappears. In this process, an important role is played by external energy factors (Sedlak, 1970; 1972).

Plasma exhibits many properties which are not visible in other physical states. One of the most important attributes is the collective response of the entire group of particles to

equilibrium disturbances. The interaction of particles in plasma leads not only to change in the direction of velocity but also to an exchange of energy between the particles. In plasma, during the interaction of particles kinetic energy can be transferred from one particle to another, or a portion of kinetic energy is converted into other forms, for example radiation. In the processes of elastic interaction with atoms, electrons behave like waves, which results in smooth transition of the wave through the atom. Such action is called the Ramsauer effect (Sedlak, 1975). Zon in his scientific analyses shows that a biological cell can be regarded as a system comprising physical plasma. In old age, physical plasma in biostructures undergoes pathological changes (Zon, 2000).

Viktor Inyushin defines bioplasma as a state of matter that occurs in living organisms. What makes up bioplasma is electric charge, subatomic particles, atomic and molecular ions, molecular ions of oxygen, virtual particles and electromagnetic radiation. Inyushin discusses two categories bioplasma: somatic bioplasma and germ bioplasma. The former occurs in cell membrane structures, while the latter is found in cell nuclei. Both of these types of bioplasma interact with each other through fields and bioplasma channels through which particles are transmitted together with information. Somatic bioplasma components are dispersed throughout the body in the form of a specific wave structure (biohologram), which contains information about the function of a given organ and the whole organism. Physical fields which occur in bioplasma are thought to form a biological field. Bioplasma takes on different values of concentrations in different parts of the body, as the particles making up bioplasma can move around throughout the biological system. However, bioplasma is intended to maintain balance of concentration between carriers within certain proportions for individual parts of the system. The greatest concentration of electron-hole plasma, electron-proton plasma and the greatest saturation with wave processes are to be found in the brain, spinal cord, peripheral nerves and receptor cells (Inyushin, 1974). Inyushin and his collaborators assume that it is possible for bioplasma portions to detach from the body; such portions are referred to as bioplasmoids containing bioholograms. Such a phenomenon can be observed in individuals whose minds are in a paranormal state (Inyushin, 1977).

According to Sedlak, bioplasma would therefore operate as a generator of information, an information coordinator and carrier and transformer. Bioplasma integrates and transmits information to prepare a comprehensive picture, it creates unity out of different bits of information and produces a comprehensive picture of reality together with the identity of a specific person. Plasma is precisely such a state of matter that is unity in diversity and has a distinguishing feature of an information integrating factor. A change of information refers to changes in temperature, pressure, gravity, electric and magnetic fields, chemical, acoustic and optical changes. Any such energy delivered to plasma increases electrical symmetry, imparts speed to particles, prevents destabilization processes or bioplasma degradation (Sedlak, 1979: p.265).

Sedlak believes that bioplasma is passed from parent to offspring organisms. Bioplasma is a "master" (Sedlak, 1979). The idea of bioplasma may have an effect similar to that of Jungian archetypes. According to Jung, the basis of our psyche is a central force that exists in all living beings, it is that which penetrates and connects everything. In terms of Jungian archetype, it is intended to mean a prototype, the main idea, a standard defining human development and it also contains laws controlling this development. Archetypes are patterns of experiencing the world, oneself and others, they are imprinted in our psyche, are a link between us and our ancient ancestors. They are also what the human race has taught us over tens of thousands of years of its existence (Jung, 1976). Archetypes never had a beginning in terms of organic life, they appeared together with life and are the common heritage of humanity (Jung, 1976; Jung, 1993).

Jung's and Sedlak's words can be traced to biblical terminology, stored in the form of poetry: "In the beginning was the Word" From the point of view of physics, it is programmed information, accurately recorded in original quantum plasma, which is a legacy for all generations of mankind. Primary bioplasma is eternal and pervades the whole cosmos. To some extent, it is being fine-tuned by conscious inhabitants from the humanity's entire existence in four-dimensional space-time.

The ultimate goal of humanity is to achieve such a degree of development of knowledge of the world and technology in order to participate in the formulation of a new version of bioplasma using

the 'tools' inherent in the hidden order postulated by Bohm. The aim of bioplasma is supposed to be the creation of a new face of the four-dimensional universe in which there will be room for a new Man - *homo electronicus*.

Conclusion

In science there is an established view that light emission accompanies all changes in nature, from the smallest nuclear fission, of cell division, fertilization of the egg to the death of a multicellular organism. The primary base of biological life is electromagnetic processes occurring at the molecular, cellular and general body level: electrical activity of neurons, electric and magnetic field of the heart, of the brain, muscles, transcription of the genetic code and all biochemical reactions.

In Einstein's theory, the speed of light is the maximum permitted speed that we find in nature; this is intended to mean that the processes of life can only be made in such a dimension that is dictated by light. Bohm's theory states that the

energy of morphogenetic fields, both in movement and at rest is zero, so for them there is no breakdown of space into a temporal and spatial part. The energy pulse tensor, as a four-dimensional vector assuming zero value, is found in all areas of space. Thus, the speed of signal transmission by means of these fields can vary in the range from zero to infinity, depending on the physical phenomenon causing these fields to exist. This implies that life includes an area of quantum processes that occur at the speed of light, but also those that go beyond the speed of light (Molski, 2005). Bell's theorem means that at the subatomic level, the various components of the universe are connected by a direct and immediate relationship independent of time and space.

Science is faced with a new challenge - to learn more about the operation of Bose-Einstein condensates in human biological systems, about solitonic waves and their information function for biological systems, and to investigate bioplasma, which, in particular, is responsible for human psychosomatic states.

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