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István BÓKKON,

### ABSTRACT

There are thousands of experiments in the world of science, but we do not have a uniform system, in which different results from the divergent development of science, as well as from our entire world can be connected to each other in a wholistic way. If divergence predominated over convergence, it would favor destructive and self-disastrous processes. Besides, it is indisputable that such a complex theory must involve the matter of consciousness and of the subconscious, as well as laws of physics, similarly to the concept presented here. According to Neumann's reasoning, and because the brain does not use the language of mathematics, any complex theory should think in terms of tendencies and processes instead of formulas. Therefore, the complex theory described in this paper works in processes. In the first part of this article a possible role of the brain's biopiezoelectric crystals is shown as they could take part in the process of storage of conscious information in a holographic way in the brain. The second part describes a concept of quantum vacuum theory of the unconscious implicit background (subconscious) and its connection with consciousness. In the third part, the global role of virtual particles (scalar waves) in the processes of the brain and in the material world is raised.

*Keywords:* Synapses, biopiezocrystal, information, virtual particles, geometry and vacuum field.

#### **1. Could synapses be parts of the information storage process?**

Informational processes of the brain cannot be limited just to the induction of action potentials and to the interaction of synapses. Many other biophysical and physical events may also be able to process, transmit or store different information [1]. Some forms of motile single-celled organisms are able to swim, find food, learn and multiply without processing nerves. Nowadays many scientists think that storage of conscious information of the brain is realized by the network of synapses. However, every single discharge of a synapse is an individual event, therefore, the bit models of the brain are hardly realistic. Synapses are not constant molecular structures, thus synapses networks can hardly be units of the conscious memory [2]. Since Lashley's experiments, it is well known that a significant part of the cerebrum could be removed without the loss of memory [3]. Yet, in many cases there is a loss of long term memory even after only small injuries in the brain. (In such cases probably one of the important

functional parts of the brain is injured.) Such injuries of different degree of the brain also illustrate that the network models are not realistic. In 1972, Paul Pietsch biologist made experiments with salamanders [4]. In a series of over 700 operations on salamanders, however, he discovered that their learned behavior was not affected by repositioning, reversing or even shuffling the brain of salamanders. After recovering from the operation their behavior returned to normal. We should think about it!

The electric shock that makes chaos in the brain cannot cancel conscious long term memory, so we can conceive the idea that conscious remembrances are not electrical features. In the case of magnetic fields, there are many successful (although contradictory) experiments, showing that different AC and DC magnetic fields or different combinations of them influence learning, behavioral and emotional states or induce histological changes in the brain [5-7]. It has to be emphasized that magnetic fields have an influence on temporary functions of the brain cells, but do not affect previously fixed conscious remembrances (long term memory).

Therefore, the conclusion is reached that different electric, magnetic or electromagnetic radiations [8-10] have an impact on temporary electric or magnetic functions of the brain cells, but do not have an influence on fixed remembrances (long term memory).

According to Christof Koch [11] “the brain should really be viewed as a hybrid computer, one that employs both digital pulses (between neurons) and analog computations (within them)”. However, analog computation systems can store much more information than digital systems. Besides analog computation systems, unlike digital ones, can be associative systems. Both features (i.e., large information storage and association) are characteristics of consciousness. Penrose and Hameroff [12-13] think information storage in cells within the brain neurons and glia can be realized by microtubules. So we should search for signs of information storage within cells.

To illustrate this, let us consider a simple fact: we get visual pictures only *via* electromagnetic waves. When computers store information in electric or magnetic digital units, we can see pictures only if information can be transformed into electromagnetic waves on the computer screen. When having a dream (with the prefrontal cortex and primary visual cortex completely deactivated), however, we have vivid, visual experience without any electromagnetic wave received. This cannot be guaranteed by the electrical synaptic processes. According to P. H. Skinner of the University of Arizona, both consciousness (thought) and light (waves and photons) function as carriers of information and action, and both appear to be self-referential. Light can be a carrier of consciousness and can be the basis for a psychophysical hypothesis of consciousness. Human memory can operate through pictures and we link these pictures to each other in the learning process. It seems to be quite suitable that we search through our conscious information stored in the electromagnetic fields within cells.

### 1.1. Piezoelectric crystals in the brain

Lang et al. reported a series of experiments in the periodical, *Bioelectrochemistry and Bioenergetics* [14]. They examined biocrystals in the pineal gland, the pituitary gland, the cortex and the cerebellum. Their central aim was to examine microcrystals in the pineal gland.

Nowadays microcrystals of the pineal gland have been called just as "brain sand", the quantity of which grows with age. Moreover, it is known that several kinds of electromagnetic beams have significant effects on the secretion of melatonin in the pineal gland [15-17]. This means that the pineal gland is presumably both a photoreceptor and a magnetic receptor.

There is microscopic evidence of an intimate association between calcification and the cellular membranes [18]. According to certain authors [14] microcrystals with piezoelectric quality are able to induce or change the charge dispersion of a given surface, because the crystals compose associations with the cell membrane. Thus, motions of the membrane induce distinct piezoelectric activity. In addition, converse piezoelectric effect may also occur: electric radiation causes crystal deformation, having an effect on the cell membrane. These electric or mechanic changes may launch so-called "intercellular second messengers", which process may regulate metabolism.

The piezoelectric activity of tissues in the pineal gland was distinctly proven (by second harmonic generation measurement: SHG), and the tissues from other parts of the brain mostly showed piezoelectric activity as well [14]. Researchers found unusual crystals in the pineal gland and one crystal in the pituitary sample. They also raised the possibility that the SHG response was produced by small crystals located below the surface in the SEM views, but which were accessible to the laser beam during the SHG determination. This means, piezoelectric crystals may also exist, although not as closely located as in the pineal gland, in other parts of the brain.

The composition of two unusual microcrystals found in the pineal gland are the following: (1) 3.4% Al, 32.9% Si, 1.3% Cl, 10.4% K, 2.5% Ti and 9.5% Zn; (2) 5.3-8% Al, 29.8-31.4% P, 6.7-14.9% S and 48.4-55.5% Ca [14]. Nonetheless, the function of piezoelectric activity of the micro-biocrystals remained unknown.

### 1.2. Extension of information flow to inorganic biocrystals of the cells

Various cell components also display electric features. It seems that proteins, DNA and RNA can be semiconductors in their native condition in the cells [19,20]. The cell membrane has a density of about  $10^{11}$  pores/m<sup>2</sup>, and it is not a uniform non-conductive bulk phase. In contrast, there are transient fluctuations in the bilayer structure (as suggested by computer simulation), which may facilitate ion transport [21]. The current-voltage characteristics of the bilayer are non-linear, namely, the bilayer is a

quasi insulator. There are conductive and non-conductive parts in the bilayer, and semiconductor proteins are also found in it. The cytoplasm is not simply an aqueous solution of macromolecules, but it is a structurally and dynamically organized network (cytoskeleton) of interconnected protein polymers, which are located in the ordered water/ion solution. Living systems appear as liquid crystals (quasi-crystals) [22,23]: motion of a single component of the cell causes changes in the entire network, and therefore, other components perceive and get information from the motion. Moreover, a cellular bioelectromagnetic field also exists, which is supported by the fact that almost all biomolecules (components) are ions or substances endowed with high electric dipole moments. Therefore, when their charges move, an electromagnetic field is generated.

There are certain successful experiments in which nerve cells are grown together successfully with non-organic silicon-crystals, and the change of electric signals is created between them [24]. The latest experiment and examination technologies use piezoelectric immunosensors or semiconductor nanocrystals [25].

It appears, unusual magnetic and electric nonlinear processes emerge at nano levels, allowing connections between organic and inorganic informational processes. Charles Harris and his collaborators (at the Lawrence Berkeley National Laboratory) performed experiments to examine the behavior of electrons at phase interfaces: the surface of a piece of inorganic silver was coated with organic paraffin and was illuminated with tunable laser at femtosecond pulse. The silver surface emitted electrons that could bind to the lattice of paraffin as polarons. Polarons could exist for approximately 1000 femtoseconds, and returned to the silver phase by tunnel effect. The important role of this phenomenon in biochemical processes is emphasized.

Not only an electric connection can be generated between organic and inorganic molecules in the cells, but electromagnetic waves mostly generate effects along cell membranes as well [26]. In *in vitro* experiments, weak electromagnetic fields had a direct influence on the kinetics of crystal formation [27]. Since the living cells can produce coherent electromagnetic waves (biophotons) [28-30], operative electromagnetic connections may be formed between organic and inorganic molecules.

Moreover, holographic lithography may also work within the cells (generating crystals by interference of non-coplanar coherent biophotons) [31]. After all we should think operating organic informational processes may be linked to operating inorganic informational processes in the cells [32].

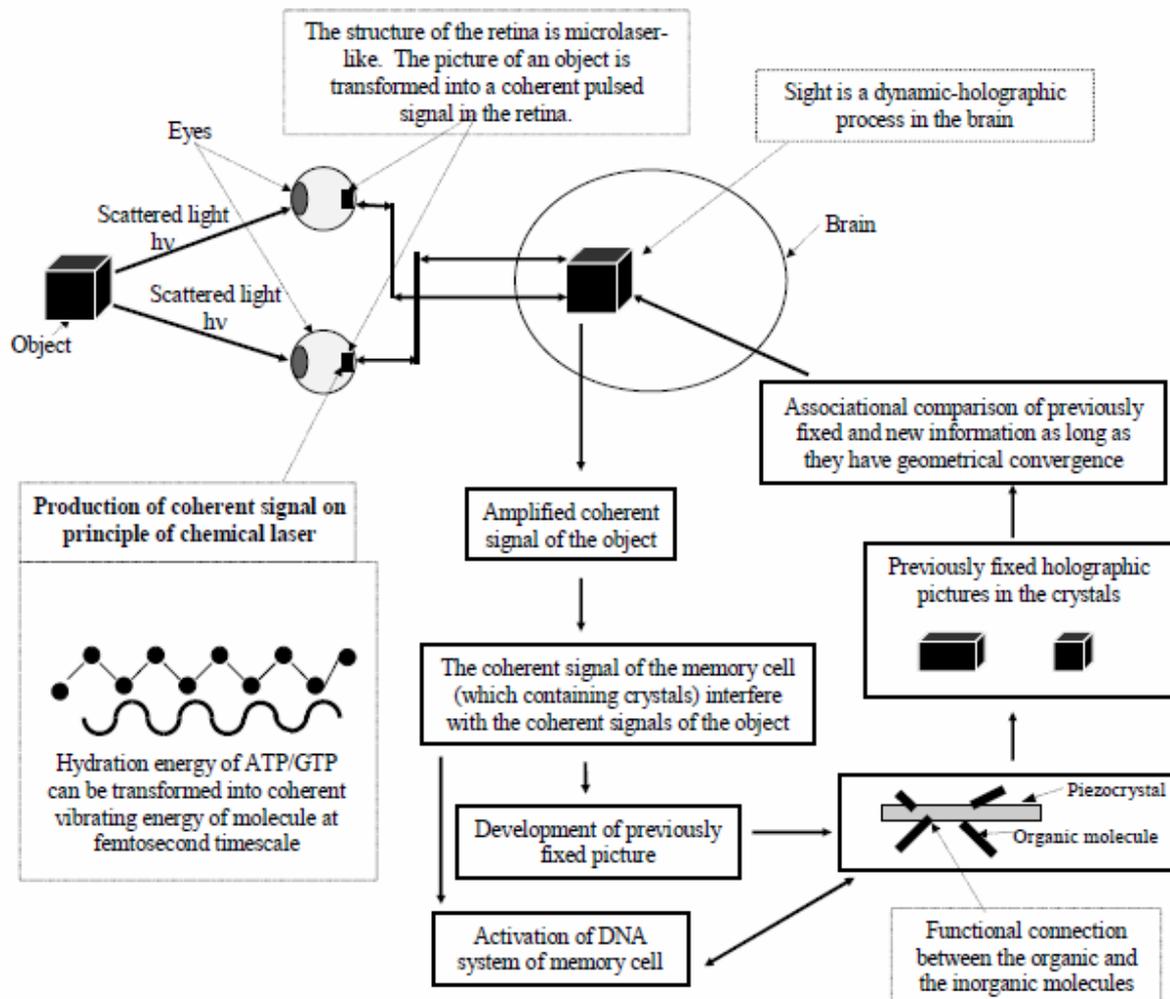
### **1.3. Biopiezoelectric crystal as means of holographic storage of information in the brain**

This section describes a concept about holographic information fixing in the brain *via* biopiezoelectric crystals in the brain. First, the biopiezoelectric crystal can act as a holographic fixing material. Second, features of the nano world allow an informational (operational) connection between organic and inorganic

materials. Third, experiments indicate that living cells are able to produce coherent biophoton waves. This latter phenomenon probably proceeds on the basis of the so-called chemical laser-effect, namely if the process of chemical reaction is faster than the lifetime of the excited state of the molecule, the energy of the reaction turns into coherent waves. Fourth, Prof. Ehud Ahissar at the Weizman Institute reported that it is quite possible that cells are tuned to a permanent signal-bearing frequency – according to his experiments in the rat's brain. This frequency may be the reference beam, which can develop the holographic fixed information from the piezoelectric brain crystals. This is analogous to the major histocompatibility complex (MHC), which serves as an implement of self-identification of the cells in the complete organism at the biochemical level. This permanent signal-bearing frequency is a means of self-identification at the electromagnetic information level. The permanent signal-bearing frequency may be originated from coherent femtosecond motion of DNA reactions (DNA is the same in all cells). Fifth, holograms have an interesting feature: information is coded in them in a noise-like way (Claude E. Shannon also showed that the most effective code is the noise-like code [33]). It seems, that random noise can help the reaction of the neuron system (non-linear resonance) given to a weak signal [34]. The living processes work at femtosecond scale and biophotons have perfect coherence, so nervous tissue can work at cellular level despite the stormy like environment. In Section 2.4. I point it out that brain regulation can be achieved by scalar waves, so it also can avoid noises from the environment, because it takes place in subquantum fields. We should distinguish between two things, the noise of environment and the noise of vacuum! Altogether, all elements are available in the brain to store information in a holographic way.

The theory presented here on the involvement of piezoelectric crystals in holographic information fixing in the brain is depicted in Fig.1. Pieces of first information can be fixed consciously in crystals of cells that reached a functional level of development (after birth, as the functional level of the brain needs external stimuli [35]). Among these cells the coherence is strong enough to induce a suitable genetic program, which can operate or start the development of self-organizing crystals from inorganic (or organic?) materials. In this process, fixed information is formed by previously fixed information, and therefore it can form an associative informational system. The new and the previously fixed dynamic-holographic information are compared in iteration as long as the new and previously fixed information can be convergent or identical. Cells are tuned to a permanent signal-bearing frequency. These oscillations are frequency modulated according to the information coming from the surroundings. The permanent signal-bearing frequency can also be the reference beam. It is reasonable to assume that biopiezoelectric crystals, being a form of photorefractive nonlinear piezoelectric crystals [36], also refract light (although this assumption has not yet been experimentally proven). Their features can guarantee processes of dynamic and associative-holographic information fixing.

Fig. 1. Concept about holographic information fixation in the brain



In the retina the picture of an object is transformed into a frequency-modulated, coherent signal. The induced Brillouin-scatter (*optical phase conjugation in non-linear system*) could guarantee the transmit of the information without deformation. The coherent picture of an object, which is originated in retina, can enter the brain system. At the same time, a phase conjugated signal goes back to retina. If the signal of the object is strong enough and we can pay attention to the object consciously, then cells can produce coherent signal about the pictures - *in cooperative processes* - which are strong enough to induce and operate the build up of crystal by the DNA system. Then picture is fixed in a holographic way in the piezocrystals. The new and the previously fixed dynamic-holographic information are compared in an iterative way as long as the new and previously fixed information can be convergent or identical. A new picture does not need to it can be identical with previously fixed picture. It is sufficient if the new and previously fixed pictures have the same geometrical convergence. It is very possible that the pictures have several copies in different cells' crystals. In my opinion that the conscious brain can use a language of dynamic geometry in holographic way. I believe an informational connection may exist between pictures and sounds. Chemical signals of sounds can be transformed into electromagnetic signals in the brain, namely information of sounds also could be stored in the piezoelectric crystals. Information of sounds can induce pictures and vice versa.

Not only these photorefractive crystals may work through energy coupling, but they may also serve as phase conjugated mirrors, so they may be able to synchronize two or more separate laser beams (biophoton synchronization). If the different, incoherent light-beams reach the photorefractive crystal, it is able to merge them. If two beams are modulated then a picture on one bundle will be recopied to the other, and vice versa. The refraction index of the photorefractive crystals is changed by a small intensity of the light i.e., about  $0.001 \text{ Watt/cm}^2$ . These features can make the photorefractive crystal an ideal holographic storage device in the brain's cells.

A given piece of information has several copies in different crystals of cells. This can explain why smaller or bigger parts of cerebrum can be removed without a loss of memory. In addition, photorefractive crystals are able to synchronize two or more separate laser (biophoton) beams. It appears that overextensive synchrony may cause dynamical diseases, such as epilepsy or tremor [37]. It may be the biopiezocrystals that take part in synchronization processes in the brain. Moreover the theory of holographic memory-fixation is further supported by several scientists believing that our brain is built up holographically [38,39].

However, I think pineal gland can work as an important part of conscious memory storing system. It can be explanation why number of crystals increases in the pineal gland - and it is also possible in the other parts of the brain - with age.

Photorefractive piezocrystals can rewrite information (in an association way) on each other so there is not information waste despite if some crystals can be eliminated. In the end nobody know why brain has to keep its temperature so exactly about  $37 \text{ }^\circ\text{C}$ . My theory can answer it. If biopiezocrystals can take part in information processes in holographic way and change of temperature is too large then density of piezocrystal change than it deform fixed pictures in the brain.

In summary, the existence of biopiezoelectric crystals in the brain presents the first possibility to assume that the brain's conscious information fixing processes are organized truly holographically.

## **2. Development of consciousness from unconscious implicit background**

The first part of this article described a scientifically based theory about conscious information fixing in the brain. But what is consciousness? In 1950, Penfield performed experiments on epileptic patients [40]. He stimulated the dominant hemisphere with the help of inserted electrodes. According to Penfield, patients under stimulation could see and hear their own past, but these perceptions were not memories, rather flashes of the past. According to Sergei Ivanov [41], patients in the Penfield's experiments lived through experiences that could not be connected to any conscious experiences or decisions, so memory pieces were not parts of the conscious memory. It seems that the brain can keep pieces of information,

which could not have been recorded consciously. What could be these flashes of the past in the Penfield's experiments? Blinks of an unconscious implicit background. According to "Gestalt psychology", the background is very important because it can be the basis of relationships. Anything can exist only if it can be compared to something else.

J. Kevin O' Regan et al. [42] emphasize the significance of the memorized background: "If only attended parts of the environment are represented in the brain, how can we have the impression of such richness and completeness in visual world outside us? The answer might be that the visual world acts as an external memory". Wolfgang H.R. Miltner et al. [43] claim: "We show here that increased gamma band activity is also involved in associative learning. In addition, we find that another measure, gamma band coherence, increases between regions of the brain that receive the two classes of stimuli involved in an associative-learning procedure in humans". And according to Eugenio Rodriguez et al. [44]: "We show for the first time, to our knowledge, that only face perception induces a long-distance pattern of synchronization, corresponding to the moment of perception itself and to the assuming motor response. A period of strong desynchronization marks the transition between the moment of perception and the motor response. We suggest that this desynchronization reflects a process of active uncoupling of the underlying neural ensembles, that is necessary to proceed from one cognitive state to other".

These cited experimental results help describing simply what processes may take place in our mind. The brain unconsciously and continuously records information during the entire lifespan as an implicit background (the background is considered as the total environment throughout the entire lifespan and it is stored in the vacuum fields as pointed at in Section 2.2.). The conscious parts of the brain record just those pieces of information, which reach critical energetic and coherence levels among the brain cells. In such cases, the brain is able to discern information from the background, and possibly can record conscious information in a holographic manner in the different biopiezoelectric crystals.

### **2.1. Why can the subconscious exist?**

Teleportation guru, Zeilinger says: "Yet I am not convinced that living systems are just classical machines" [45]. In 1999, "Judith Klinsman and colleagues demonstrated that to speed up crucial cellular chemical reactions, some bacterial enzymes rely on the tunneling of protons - a quantum process that allows a particle to pass through a barrier even if it hasn't got enough energy to climb over" [46]. Well, the living cells are quantum "devices" rather than simple mechanical machines.

According to Roger Penrose: "some as yet undetermined non-computable processes are operating in the brain" [47]. Living organisms are cooperative, nonlinear systems, far from the equilibrium. Namely, organisms or organs (brain) have extreme sensitivity to pick up information from the outside world. Information cannot be realized in our mind, if it cannot reach a suitably strong level of energy,

nonetheless, even information below this critical level can enter the brain. For example, a rod cell in the eye can perceive and transform a single photon of light into a neural signal [48]. However, one photon does not originate conscious information in the brain, but it enters the brain, and it is possible that the brain works with such an ultra weak photon signal.

The conscious hearing is not a thermal process [49] much rather is a nonlinear cooperative process of the cells, if the signal of the surroundings is strong enough. The ear can also perceive weak information, which could not be conscious. The ear works as a mechanic oscillating system if it gets a suitably strong sound signal, but it can also perceive weak signals. How? Cells in the ear may originate continuously an own ultra weak, electromagnetic oscillation, and the signals of the surroundings could superimpose on the cells' own oscillation.

In case of sensing smells, there also exists a kind of a weak and not conscious perception. It was discovered (two decades ago) that humans can perceive weak signals of molecules (pheromones) just like other mammals including rats [50]. Many behavioral signals relate to the fact that a "sexual nose" (non-conscious olfactory perception) works besides the "thinking nose" (conscious smell perception). The "sexual nose" can affect unconsciously the emotions and the behavior.

The above-mentioned processes are similar: information can become conscious (explicit), only if it reaches a critical level of energy (sight and hearing) or concentration (olfactory sensing), and then brain cells can produce a coherent signal in cooperative processes. At the end, the brain perceives these signals consciously. This implies that the general informational sensitivity of the brain far exceeds that of its conscious parts!

In reality, subconscious can evolve from unconscious implicit background and these not realized subconscious information can work independently in the brain [51].

## **2.2. Quantum vacuum theory of the unconscious implicit background**

It seems that consciousness can evolve from the unconscious implicit background only if a signal is strong enough. But where could the information content of an entire lifespan be stored? This represents an about 600.000 hour-long film as a background! According to Turing, thinking-machines need boundless data storage capacity. It seems that the brain has such a boundless data storage capacity as a background. Where is it located? I believe, it can be in the quantum vacuum. Nowadays, magnetic or electric processes are used to store information, but we have no knowledge about the possibility of information storage in the potential of vacuum fields. Many scientists believe that the most important achievement of modern physics is the discovery of the dynamic character of vacuum. Vacuum is not an empty space - it can have a structure [52].

Theodor Kaluza and Oskar Klein took an idea that the four space-time dimensions that we

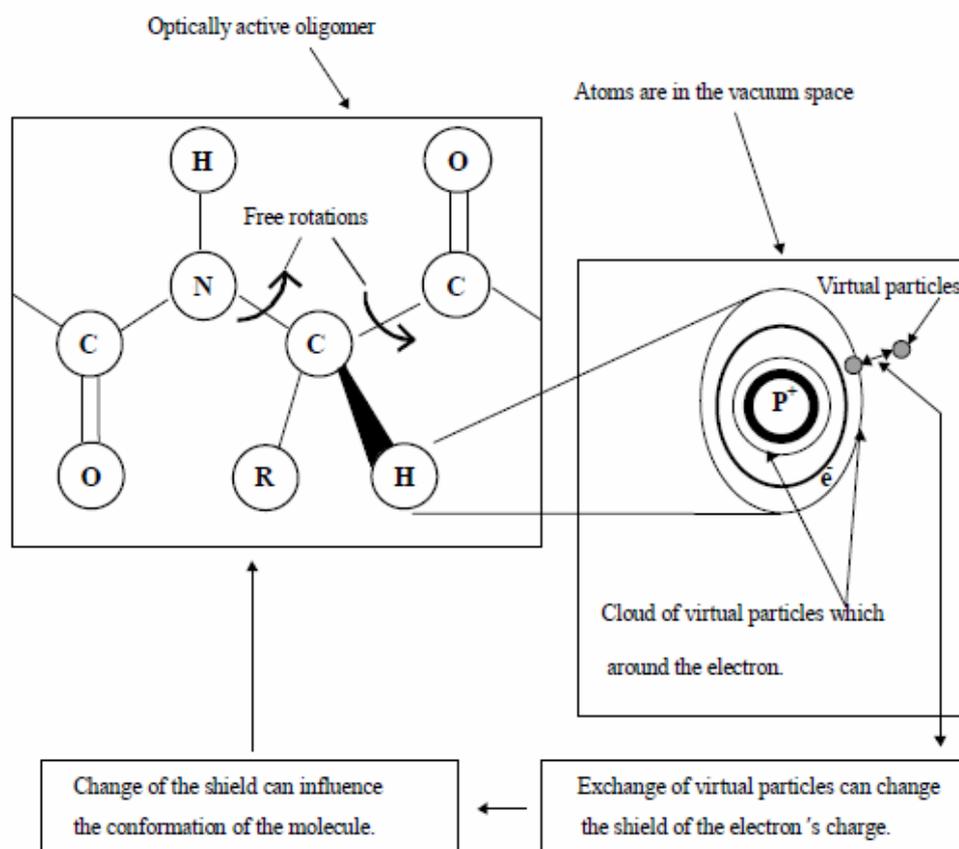
observed could be supplemented by extra dimensions [53]. Their model could not be a correct description of the real world but their idea of extra dimensions with finite extent has become a central component of string theory. According to Reginald Cahill and Christopher Klinger, trees “gebits” (they believe in their pseudo-objects, which are randomly connected with each other and form trees “gebits”) build up the material world, acting like bits of geometry [54]. John Wheeler and Roy Frieden think, physics operate on the basis of information. But where is the giant geometrical field of information where the background field of the brain could also exist and where is the hidden world (with extra dimensions) from which our material world was originated? It is in the structured and coherent quantum vacuum from which our material world was originated and which works as a geometrical information field.

Pati A. K. and Braunstein S. L. [55] showed that “no one can obliterate a copy of an unknown file from a collection of several copies in a quantum computer” because we have several copies of photons in an unknown state. This is the non-deleting principle in the quantum world. It means that all information, which is originated from the material world, can exist forever. Namely, the quantum or sub quantum (vacuum field) world can possibly store the information content (events) of the entire lifespan of the cosmos. So vacuum is not only a field where the laws of physics originate from, but it is also a field, which can keep all information of the material world, among others, as background information for the brain.

### **2.3. Informational connection with vacuum**

If vacuum can be a means of geometrical informational storage, what could guarantee the flow of information between coherent vacuum and decoherent material levels? The answer is virtual particles (scalar waves). In the quantum-space theory all interactions are represented by exchange of virtual particles [56]. Nonetheless, the role of virtual particles cannot be restricted only to these interactions. All elementary particles continuously produce and swallow virtual particles. We can find a suitable mechanism, which can change information between vacuum and molecules (Fig.2). The exchange of a virtual particle can change the cloud of virtual particles around the electron [57]. Then it can change the shield of the electron’s charge, and it has an influence on the conformation states of optical active oligomers (free rotations around the C - C and N - C single bounds give the theoretical possibility of an infinite number of conformations).

**Fig. 2. Connection with structured vacuum, a field of geometrical information storage**



In reality all electrons exchange virtual particles continuously so it is an extremely complicated process. Vacuum space is a coherent, structured, self-organizing wave system of information. Its connection with the material level is mediated by virtual particles.

What kind of processes can guarantee the flow of information in such a geometrical information field and transmitting virtual particles? The accelerating translation, rotation and vibration of the elementary particles and molecules (guaranteed by free energy) can guarantee this. The accelerating motion can disturb the coherence of the vacuum and can allow the virtual particle to become real (Davies-Unruh- effect) [58-60].

However, in the living cells, all the motions of the molecules are accelerating, nonlinear vibrating, translating or rotating motions. As a result, the accelerating motion can guarantee the appearance of virtual particles i.e., the elementary particles can exchange virtual particles in dynamic states. The experimentally proven Casimir-effect is also caused by virtual particles, thereby those materials can destroy the homogeneity of the vacuum [61]. Besides, Umar Mohideen and Anushree Roy -

at the University of California - proved the dependence of the Casimir-effect on geometry. Our material world has a dynamic geometrical structure and Casimir-effect is dependent on geometry so vacuum has to have a structure because the Casimir-effect is a manifestation of vacuum. Two systems can influence each other only if both have structure. This result suggests that geometry, the accelerating motion of molecules, as well as virtual particles are the key factors of the communication between the coherent structured vacuum and the decoherent material levels.

#### **2.4. Uniform regulation of the brain**

There are numerous different operation systems in the brain, working in cooperation and simultaneously. Informational processes - at different levels - must be regulated very fast and uniformly. It is possible that several different coherent states operate in the brain in parallel, but there must exist a coherent field, which can expand to the entire brain. Virtual particles, in other words quanta of scalar waves, can take up optional small values. The smaller the mass of the virtual particle is, the longer time it can exist. The faster the velocity of the virtual particle is, the lower its mass can be. Thus, in principle, the velocity of the virtual particles is boundless. These features make the scalar waves to be able to originate coherence, which reaches across the complete brain so this process guarantees coordination of the complete brain's informational processes simultaneously.

Mitja Perus of the Slovene Society for Cognitive Sciences states that “quantum systems are the microscopical basis of all physical processes and of biological or psychophysical processes also: all the classical world arises from the overall quantum background. Consciousness is a result of neuro-quantum interactions (interaction of classical and quantum world)”. I believe consciousness is a result not only of neuro-quantum interactions but also neuro-subquantum interactions, where the subquantum level is the vacuum information field. I think synapses sense information, and they are also the very structures on which conscious, unconscious information can manifest in form of motion, nonetheless, they cannot store conscious information.

### **3. The global role of virtual particles can be an explanation of many questions and phenomena**

Since the Innsbruck's experiments (where the EPR paradox was proven to be a failure, namely teleportation of the polarization state of the photon was proven) Pan Jian-Wei et al. proved experimentally quantum nonlocality in three photons [62,63]. However, transmission of information can be realized immediately. Information, requiring teleportation of polarization states of photons, can be transmitted by virtual particles (through vacuum).

Up till now, there are several unsolved problems of noise [64]. The noise (that can help the reaction of the neuron system given to a weak signal) can play a creative role, too. Creative white noise

may be a manifestation of geometrical information field of vacuum by virtual particles. If noise could carry divergent or random information, it cannot make coherent states in the experiments.

It is quite possible that the key issue of information's flow (at long distance, at room temperature, without resistance) can also be realized by virtual particles (scalar waves). There are relations among them: phase stiffness, the existence of virtual particles and the high- $T_c$  superconductivity [65].

If such a global role of the virtual particles can be proven true, there is a phase lateness of information transport between the macroscopic and virtual particle mediated cases. This phase lateness is a very important feature of fractals, which can be generated by the noise of nonlinear systems. Fractals may be the best models of the self-organizing organic and inorganic world [66-68]. The lateness of phase is the power of motion, because if everything could exist at the same time, no events could take place. However, virtual particles may be manifestations of an implicit geometrical information field of vacuum.

It was long time ago when Schrödinger raised an issue; that living organisms could feed negative entropy. This negative entropy can also be originated from coherent informational field of vacuum by virtual particles.

The large quantity of information, which needs to build up and operate an organism (because the genetic codes have less information-content than necessary to build up an organism) can be hidden. The real and large mass of information is in the coherent and structured vacuum, and the geometry of accelerating molecules (DNA) can possibly take information out from it.

I believe, the material world is maintained by coherent information of vacuum, and divergent thermodynamical processes try to stop its operation [69]. The dynamic equilibrium of these two processes makes the world exist.

Robert Laughlin put forward a theory in 1983, claiming that fractional-charge carriers of Hall resistance can take place *via* virtual particles [70]. We may expect to get numerous values of fractional-charge, because elementary particles may have a dynamical geometric building by numerous virtual particles. However, virtual particles have a global role not only in the coordination and information storage processes of the brain, but also in the existence of material world. Igor Sokolov, a Russian physicist now at the University of Toronto, claims "supernovae, quasars and other stellar objects derive their power from virtual particles, including virtual photons which, according to quantum theory, pop into existence for fleeting moments in a vacuum" [71]. If virtual particles play such an important role in the universe, why do we think that they cannot play important roles in the cells' processes as well as the cells are also parts of the universe!

## Summary

The complex theory presented here could give a foundation to the theory of consciousness, unconscious

implicit background (subconscious) as well as the material world in a uniform and connected system. In this theory, the material world is originated from the geometrical informational field of vacuum, which can be a ground of the physical laws. Consciousness can develop from the background if the information signal is strong enough, and then the mind can consciously pay attention to the given stimulus (signal). In this case information can be fixed in biopiezoelectric crystals of the brain in a holographic way.

Background information of the brain - as a basis of the relationship for consciousness – can also be stored in the vacuum fields. Virtual particles and accelerating molecules can realize informational connection from vacuum. This theory about vacuum and virtual particles can explain many questions opened including the living organisms' negative entropy; high- $T_c$  superconductivity; unsolved problems of noise; the large informational content of DNA; teleportation of information; coordination of the complete brain's informational processes simultaneously, and how the subconscious can exist. Besides, it is the first idea, which can link conscious information storage of the brain to stable biological substances (biocrystals as holographic stores).

It is also pointed out that the world can work and exist if it has a uniform language, and this language can be the dynamic geometry that consciousness (a hologram is a universal translator of different geometrical information), unconscious implicit background (geometrical information vacuum field) and subconscious (which can evolve from unconscious implicit background) can use.

What kind of experiments should be carried out? First, we should examine biopiezocrystals because if they are proven to be photorefractive – according to the prognosis presented here – it would be first proof that the theory of conscious information storage in holographic *via* biopiezocrystals is a real phenomenon.

Second, the composition of biocrystals in the cells of the brain (not only in the neurons but also in the other types of brain cells) should be analyzed. Because if biocrystals can take part in information processes of the brain, it would enhance the importance of microelements in biophysical processes.

Third, at the beginning of the century Neumann raised the question of the importance of continuous geometry. Since vacuum can be a continuous scalar field, mathematics should research the role of continuous geometry.

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