

The Molecularly Fielding Psychophysical Nature of the Brain Mental Activity

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Abstract

The brain is a unique organization in nature, having the psychic activity, which is expressed in subjective states: thoughts, feelings, emotions. Knowledge of the nature of mental activity of the brain is the most urgent and the most challenging task of physiology. Historically the neurophysiology developed on the basis of physical and chemical laws discovered in an inanimate nature. Our investigation is devoted towards the origin of a human subjective state, and presents a new methodology for studying of the nature psychic brain activity. We have established the existence of physical phenomena unique for the living brain so-called “psychogenic field”, which reflects the expressed psychic state of human brain. The subjective state of a human being was shown to affect remotely the physicochemical properties of the blood. An original schematic diagram is presented to describe the formation of the brain psychic activity. This approach is based on the feedback influence of a psychogenic field on neuronal molecular processes (self-induction in the brain). We propose a paradigm for the origin of psychic state and possible existence of the fields, which are unique for the brain. The presented scheme and paradigm of systemic organization of psychic activity of the brain are a prerequisite for the subsequent development of the theory consciousness.

Keywords

Mind, Consciousness, Subjective State, Brain, Psychophysics, Psychogenic Field, Quantum Biology

1. Problem of Knowledge of the Nature Brain Psychic Activity

The subjective, mental state is what each person feels in himself, as his inner state throughout life. The subjective, mental state is manifested only in living matter, thanks to the activity of the brain. In this connection, the fundamental question

arises, how does the brain generate its own internal subjective self-awareness? In other words, how is living matter organized so that it has mental activity? What psychophysical processes form in the brain its subjective self-awareness?

The brain is a unique organization in nature, having the mental activity, which is expressed in thoughts, feelings, emotions, *i.e.*, in the subjective perception of the man himself and the world.

The subjective state really exists. In this meaning, the subjective is objective too, though it takes place only in the living organization of matter. A large amount of data exists on the problem of subjective activity of the brain. They include philosophical manuscripts; psychological works describing the exterior forms of mental activity; clinical reports for mental disorders in various diseases; and neurophysiological data on the correlations and mental codes, cognitive, and sensory functions of the brain (e.g., results of functional magnetic resonance tomography [fMRI]). In the literature, different manifestations of the remote influence of the brain mental activity are given without studying and understanding of the nature these brain subjective states [1] [2] [3].

Modern science does not have even hypothetical logic constructions to explain the origin of subjective states in neurophysiological processes. The problem of knowing the nature of the brain mental activity is related to the lack of an adequate, objective methodology.

Knowledge of the nature of mental activity of the brain is the most urgent and the most challenging task of physiology [4] [5] [6] [7].

Optimistic view about the possibility of understanding of the brain psychic activity wrote I. P. Pavlov, R. W. Sperry, N. P. Bekhtereva and K. V. Sudakov. They urged us to determine a possible origin of unique brain function, the subjective mental activity [8]-[13].

According to I. P. Pavlov, “Marching forward and pressing onward, the natural and unavoidable approach and final fusion of the psychological with the physiological, the subjective with the objective is achieved—the actual question so long disquieting to human thought! And any further facilitation of this fusion is a great goal of the near future in science” [8].

The same thought was expressed by a Nobel Prize winner R. Sperry (1952): “Subjective states and properties, which were driven away from scientific explanation for a long time, should, figuratively speaking, take a driver seat in the theory of brain activity as a crown of evolution” [9].

K. Popper wrote: “We live in the world of physical bodies and we ourselves are physical bodies. When I speak to you, I do not address your bodies, rather than your minds. Here arises the question of interaction between these two worlds, the world of physical states or processes and the world of mental states or processes. This question is a psychophysical problem” [14].

2. Evolutionary Role of the Subjective State

The appearance of subjective states serves as a major evolutionary factor of liv-

ing beings, which determines the self-development of life. Subjective states are a strong intrinsic stimulus, which induces active efforts of the body to achieve a specific goal. It characterizes all sides of world perception in the life. These states serve as a directing force in survival and self-preservation of each animal and strain as a whole. Generally the subjective state reflects a strategy vector, which suggests the avoidance of harmful events and achievement of beneficial results.

Initially the subjective states in the brain were manifested as sensations and emotions, which gained the properties of bearings for existing vital demands and their satisfaction. At later stages of brain development, they also comprised mental processes which reflect extrinsic relations in the environment. The reasonable intellectual activity, as a major mean in adaptation and survival, was formed on the basis of this intellectual function of the brain during the follow-up period.

The simplest forms of behavior, including those fixed at the genetic level, are developed with no involvement of a subjective state (unnecessary in this case). These instincts are based on a reflex principle and appear as the actions strictly specified for certain stimuli and conditions.

More complex forms of behavior which suggest the freedom of choice were made possible with the appearance of a subjective state, which provides a strategy of activity under constantly varying conditions. A further evolutionary process could not be realized without the development of a subjective self-perception and perception of the surrounding world. A subjective evaluation of the environment and internal state was a determinant factor of evolution.

3. Neurophysiologic Processes and Subjective States of the Brain

The brain activity is dual in nature. On one hand, there are neurophysiologic processes. On the other hand, there are subjective states, characterizing all facets of the world-view [14] [15].

The neurophysiologic processes can be observed and registered by various methods and devices developed based on laws of physics and chemistry. The processes on the subjective level are perceived as self-sensations, which cannot be registered directly by physical and chemical methods based on the phenomena in the abiocoen. In living organism and in particular in the brain, such physical phenomena and processes may occur, which in principle, do not exist and cannot exist in inanimate nature. This thesis is of fundamental importance for understanding of the very core of the subjective in the activity of the brain. The subjective state is intrinsic to the living organization only, and does not exist in inanimate nature. Therefore, it is impossible to explain the origin of mental functions of the brain in view of the laws of inanimate nature only.

The achievements in modern neurophysiology based on structural, mor-

phological, electrophysiological, neurochemical, molecular, genetic research, computer tomography, etc. do not allow identifying of the brain psychic functions. Whatever processes are registered, the electroencephalogram (EEG), neuronal activity, neurochemical and molecular reactions etc., they do not show the internal experiences like thoughts, emotions, senses, etc. The computer tomography of a brain, mapping of gene expression in various brain structures, multichannel record of neuronal activity, electroencephalogram allow revealing only participation and interaction of various brain structures in the organization of behavior, training, memory, emotions and thinking. However, these studies do not bring us closer to understanding the origin of subjective states.

In recent years it has become popular to explain the nature of consciousness by the presence of branched neural networks of the brain. In our opinion, the statement of the existence of a nerve networks does not give anything to understand the origin of the brain mental activity.

Functional fMRT allows us to perform a vital assessment of the activity and involvement of nearly all brain structures in various forms of mental activity. However, even rigorous analytical studies of the human brain cannot give an explanation on the origin of a subjective state. Even at the highest resolution of functional MRT that provides the recording of activity for each of the billions of brain neurons, it would be impossible for us to understand the origin of a subjective component in brain function.

There are two components in the thought: its subjective nature and its specific content. When researchers write on the possibility to register a subjective state in the neurophysiologic processes, they forget what the subjective is and take the neurophysiologic processes as a real manifestation of the subjective in the brain activity. This means that they do not see any difference between the subjective and neurophysiologic processes and in fact identify them.

Several researches inspired by the achievements in neurophysiology, molecular biology, nanotechnologies, predict the possibility of deciphering of “thinking codes”, consciousness and image visualization of neuron pulse activity [11].

In fact, it is possible in some cases to see certain correlation between the activity of certain brain structures or neurons and the content side of thinking, speech, etc. This however does not mean that in these processes, one can understand the subjective state.

Among the billions of brain neurons, one can always find neurons whose activity will correlate with a particular function of the body. At the same time, the information encoding may differ among individuals and social groups. Each neuron registered in the brain is individual and different from the others.

The brain activity has two facets, visible, characterized by registered neurophysiologic parameters; and hidden or spiritual, manifesting in human subjective perception of oneself and the world around him/her. No doubt, these two facets are interrelated. However, we cannot explain how the code of nerve im-

pulses, the interaction of various brain structures, the electrophysiological processes, the molecular transformations result in the self-perception of subjective state.

In other words, it is impossible to analyze the origin of the subjective basing on the contemporary neurophysiologic methods, and all speculations are counterproductive and are unrelated to the understanding of the nature of the subjective state.

There is a huge gap between modern knowledge about brain neurophysiology and understanding of its mental functions. This is due to the fact the brain was studied with the morphological, physical and chemical methods based on the knowledge, phenomena and laws discovered in the investigations of the abio-coen. The origin of a subjective brain state is beyond the field of hi-tech analytical research.

Principally, it is impossible to explain the origin of a subjective brain activity only on the basis of neurophysiological investigations. It is a fundamental delusion when the researchers believe that they guide to the nature of a thought, sense, and other subjective states by studying the electrophysiological processes.

In this regard, N.P. Bekhtereva wrote: “It is unlikely that the full code of thought processes will be revealed only due to the impulsive activity of neurons and neural populations.... The solution of the problem lies not only in the sphere of physiology and biochemistry, but also in the most subtle branch of biochemistry—the biology of molecular processes” [12].

Analyzing the problem of the origin of a subjective state, T. Nagel wrote: “The parallel description of the neurophysiologic processes and mental states caused by them (?) or accompanied by them (?) does not help answering the question how the behavior of a neuron network produces the subjective states, feelings, self-reflection and other phenomena of high order. Without the change of the fundamental concepts of the consciousness, the explanation gap cannot be overcome” [16].

This question seems to not exist for neurophysiology. In fact, neurophysiology, by studying cognitive neurophysiological processes, identifies them with the subjective, of the brain mental activity, without seeing any specific differences in the nature of these phenomena.

The question how the brain generates its inner psychic state remains one of the greatest secrets of the nature. The general purpose of our research is to reveal molecular and psychophysical mechanisms of the brain mental activity [15] [17].

In our research, we try to find basic approaches to understanding the origin of the subjective in the brain activity, without going into the details of particular subjective state manifestations, consciousness, emotions, etc. This research is based upon the methodological principle that we formulated: “The mental processes can be directly registered and studied only using and involving living structures” [11] [17] [18]. Using this principle, we carried out a variety of series researches, and we established possibility of direct remote registration of the human brain psychic activity.

4. The Remote Field Manifestations of the Human Brain Psychic Activity

Expressed mental states of a human can be registered objectively and remotely used the indicator of subjective state offered by us [15] [19] [20]. It is important to note that the indicator of subjective state shows expressed subjective attitude of a human towards somebody or something. An expert examination of our findings was organized with the participation of leading experts in physiology and physics, which is included in the monograph [15]. These reviews highlight the reliability and repeatability of our findings.

While the credibility to our findings does not raise doubts, we wanted nevertheless to have additional evidences of a direct objective registration of the human brain psychic activity of in blind tests.

In our research, we hypothesized that the human expressed mental states may manifest itself in different forms. For registration of the expressed subjective state we used the human blood as a biological multicomponent substrate containing cells, protein-colloid and electrolyte solutions.

This series was designed to evaluate whether the expressed subjective state of an investigator can remotely and directly affect the blood, specifically the erythrocyte sedimentation rate (ESR) [18] [21]. The investigator promoted his own expressed subjective state using “imaginary-cogitative method” [15] [17] [19].

The erythrocyte sedimentation rate (ESR) of blood is determined by complex physical and chemical interactions of electrostatic potentials of red blood cells, as well as protein and colloidal properties of blood plasma.

When carrying out experimental tests, the investigator five times one after another, within 30 seconds, approached the experimental rack with blood in his expressed subjective state, during which time the rack with capillaries was placed horizontally and oriented so that the upper end of capillaries was directed towards the investigator. Control racks at this time were located at a distance, in the other room.

In these series of tests we try to find the remote direct influence of the investigators' expressed subjective state on blood in particular on erythrocyte sedimentation rate.

We use blood samples taken from healthy individuals in clinical settings. ESR was measured using standard Panchenkov method. We compared ESR figures in three capillaries fixed in separate test racks.

In the first rack, we put the capillaries with blood unexposed to any subjective influence (control). In the second rack, we put the capillaries with blood approached by the investigator in a neutral subjective state (neutral). The neutral control was necessary to exclude any possible outside influence of the investigator on ESR, e.g. associated with movement and approach of the investigators to the rack, with heat, electromagnetic and electrostatic influence of the investigator's clothes, etc.

The third rack with blood capillary was approached by the investigator in ex-

pressed subjective state (subjective). The investigator provoked his own expressed subjective state using “imaginary-cogitative method” [19]. When conducting this subjective test, the investigator was maximally focusing and concentrating his attention on something emotionally significant, whereby he induced in himself an expressed emotional stress. The researcher felt his own subjective state.

In the tests, the investigator approached the second rack five times in a row (neutral), and then 5 times in a row to the third rack (subjective) with several seconds interval. In separate tests, the number of approaches varied from one to ten. All three tests were performed at the same time with samples blood taken from one person. All racks were put in vertical position simultaneously. The ESR was calculated in one hour. All tests were conducted under constant conditions and at the same time. Within each experiment, blood of the same person was used for all tests.

We compared the ESR figures in three different racks with capillaries: control, neutral and subjective [18]. The findings were processed with standard mathematical methods to reveal regularity.

The findings demonstrate reliable difference of ESR in control, neutral and subjective tests (**Figure 1**). All subjective tests showed significant decrease of ESR. The subjective state caused ESR decrease from 1.5 mm to 2.5 mm. The higher was the baseline ESR figure in the control test of a particular individual, the bigger was the difference between ESR figures in a control and subjective

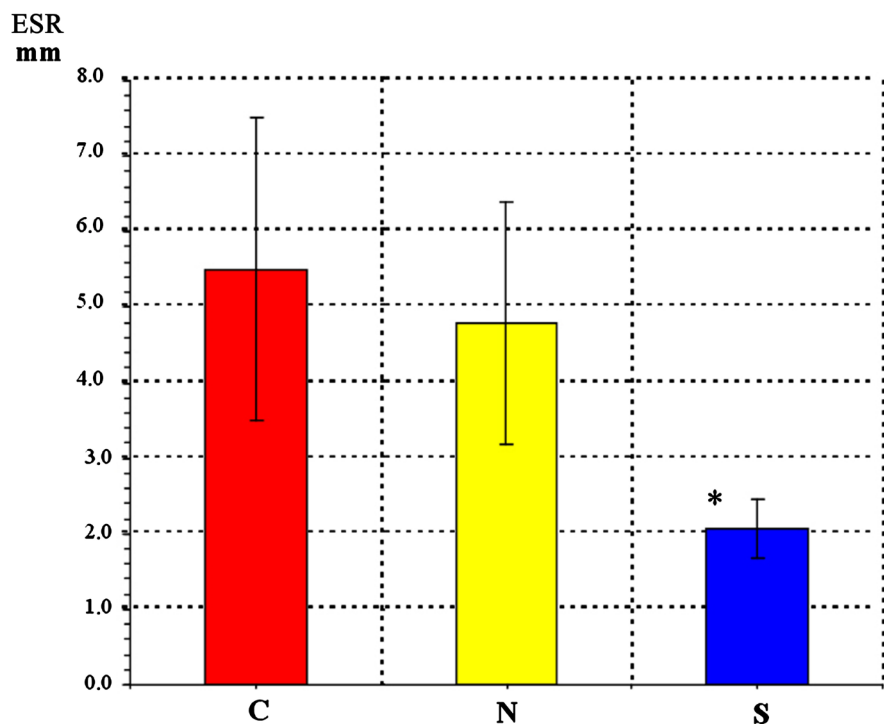


Figure 1. The change of erythrocytes sedimentation rate (ESR) in blood after the remote direct influence of the investigator by expressed subjective state. ESR mm. C—control, N—neutral, S—subjective. Reliable difference $*-p \leq 0.05$ between C, N and S.

tests. However, no reliable difference was found between the control and neutral tests which suggest that the blood was not affected by the neutral subjective state of an investigator.

Therefore, there arised naturally a question, what is the distance on which a subjective state of the investigator influences on ESR of the blood? We have found that influence of a subjective state of the investigator on blood completely disappears by the removal of the investigator on 0.8 - 1 m from the capillary with blood. Thus, the field remote effect depends on distance between the investigator and blood.

Expressed subjective state of a person has a significant remote effect on the ESR of any blood group. It is important that the blood was taken from a healthy person. Our studies did not reveal a change in ESR upon the influence of the expressed subjective state of the investigator on the patient's blood, own blood of the investigator.

In previous experiments, it has been shown that the expressed subjective state of a person provides remote field effects of erythrocyte sedimentation rate of blood, which is determined by complex physical and chemical interactions of electrostatic potentials of red blood cells, as well as protein and colloidal properties of blood plasma.

Our findings indicate the existence of certain molecular factors present in the blood, which responds remotely to mental state of a person.

The next challenge was to investigate of the remote influence of the expressed subjective state of a person on ESR in Rh-positive and Rh-negative blood¹.

There were two sets of experiments.

In the first series, we studied the effects of the direct expressed subjective influence on blood in capillaries of the Panchenkov apparatus.

In the second series of experiments, the effects of expressed subjective influence on a blood in tubes were studied. When preparing the test, each blood sample was equally divided into two portions filled into two tubes, one of which was a control tube and the other one an experimental tube. Similar to the first series of experiments, during experimental tests, the investigator approached five consecutive times, for 30 seconds to a tube with blood, being at those moments in the expressed subjective state. At that time, the control tube was located in another room.

Thereafter, blood from the experimental and control tubes was filled into capillaries, which separately installed in racks for subsequent determination of ESR as described earlier procedure.

It is important to know, whether the effect of the remote expressed subjective influence of a person on the human blood is maintained after blood mixing?

¹Experimental research is approved on the meeting of local ethic committee of First Moscow State Medical University of the Ministry of Health of the Russian Federation (Sechenov University) on May 18, 2014. All experimental works are held in agreement with ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study, to personal and experimental data processing.

The results for ESR readings were compared between control and test blood using data from capillaries with blood from different racks.

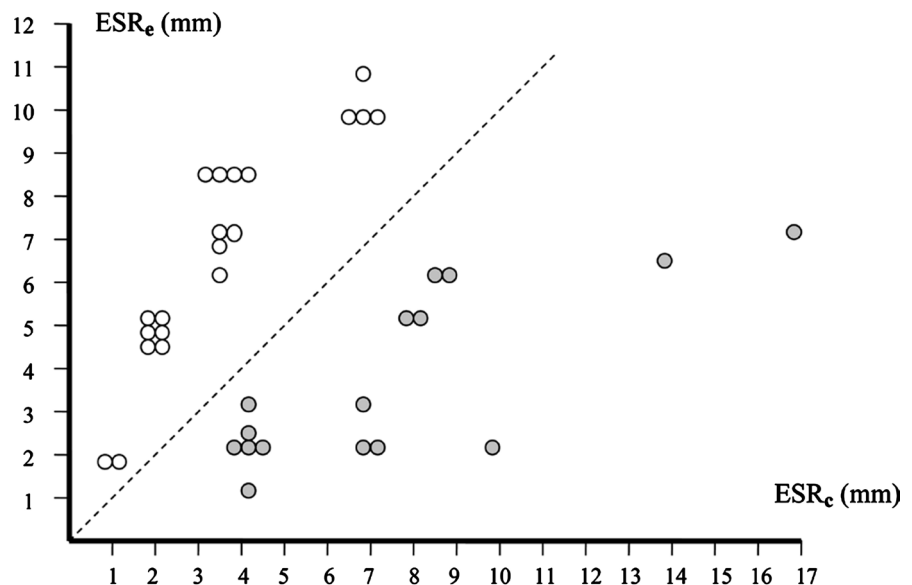
Figure 2 shows ESR values registered in control and experimental tests after expressed subjective influence of the investigator on the blood in capillaries of the experimental rack. The results demonstrate highly significant ($p < 0.0001$) differences in ESR between experimental and control tests across the entire set of data. In some tests, the values differed 2-fold or even more. It was found, that significant differences in ESR between control and experimental tests were not associated with blood group.

There were significant differences in ESR changes in experimental tests compared with control, which depended on the presence of Rh factor.

Exposure of Rh-positive blood to expressed subjective influence lead to highly significant ($p < 0.0001$) decrease in ESR in experimental tests compared to controls (**Figure 2**).

Conversely, when Rh-negative blood samples were exposed, highly significant ($p < 0.0001$) increase in ESR rate was observed in experimental tests compared to control (**Figure 2**).

There was a 100%-correlation between the Rh factor and the direction of ESR changes in experimental tests compared to control.



Blood: Rh - ○, Rh + ●. Significance of the difference in ESR in the control and after subjective exposure in Rh + blood $p < 0.0001$, in Rh - blood $p < 0.0001$. — — an imaginary line on which experimental values ESR_e would be located, if they were equal to control values ESR_c : $ESR_e = ESR_c$. Above the line: $ESR_e > ESR_c$, below the line: $ESR_e < ESR_c$.

Figure 2. Changes in erythrocyte sedimentation rate (ESR) after exposure of blood in Panchenkov apparatus capillaries to expressed subjective remote influence of the investigator. Legend: x-axis—background values ESR_c (mm) in each individual test in the control; y-axis—experimental values ESR_e (mm) in each individual test after subjective exposure, relative to the background value in the control— ESR_c . n—total number 86 of measurements in 31 subjects—healthy men aged 19 - 30 years with different blood groups and Rh.

These data indicate that regardless of the presence or absence of the Rh factor, there was always the reaction of blood to remote expressed subjective influence, leading to significant changes in ESR.

The remote effect of the expressed subjective influence causes highly significant opposite changes in ESR in the Rh-positive and Rh-negative blood. This fact points to the existence of two different mechanisms of a blood response. The first mechanism, which causes a decrease in ESR, is manifested in the presence of the Rh factor, which is in the erythrocytes. The second mechanism that causes an increase in ESR is observed in the absence of Rh factor.

It can be suggested, that such effect occurs due to the combined remote action of the expressed subjective state of a person on various molecular structures of blood. Apparently, in the absence of the Rh factor, the effect of the subjective state of a person on ESR is shown through other molecular structures of blood.

In the next study, blood mixing occurs inevitably after the expressed subjective influence on the blood in a tube and subsequent transfer of this blood into capillaries for ESR determination, and this can affect or eliminate the detected effect of remote influence of the subjective state of a person on ESR of the blood in capillaries.

Figure 3 shows the results for ESR values registered in control and experimental tests after remote influence of the expressed subjective condition of a person on blood in a test tube.

The results demonstrate (**Figure 3**) highly significant ($p < 0.0001$; $p < 0.001$) differences in ESR between experimental and control tests on the entire data set. In contrast to the first series of experiments, in this series the ESR changes in experimental tests in comparison with the control were unidirectional both for Rh-positive and Rh-negative blood. This effect cannot be attributed to the difference in blood groups, as from the results of the first series of experiments we see that the direction of ESR changes does not depend on a blood group.

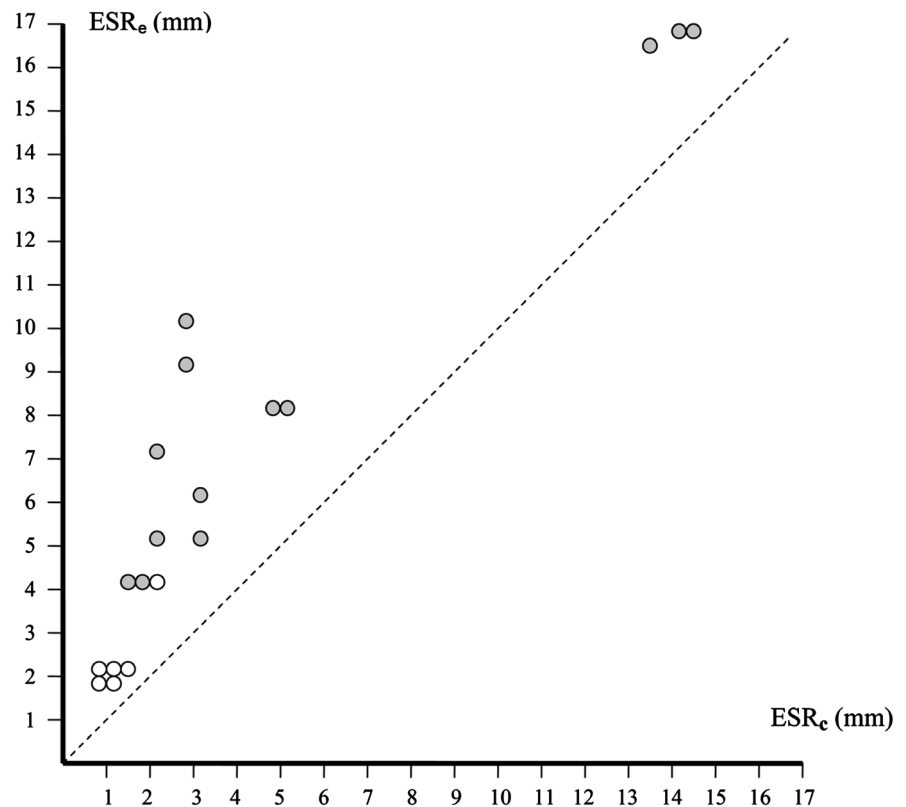
Everything, caused by expressed subjective remote influence of the investigator, changes of ESR remain within normal values, characteristic for the healthy person. When in experiences blood of sick people with high value of ESR (30 - 40 mm) was taken, subjective exposure on blood didn't cause any changes of ESR.

There are statistically significant results obtained which demonstrate contactless remote influence of the subjective state of a person on erythrocyte sedimentation rate Rh-positive and Rh-negative blood, and under different conditions of exposure.

The main outcome of this series of experiments is the finding that after mixing of blood, the effects of expressed subjective remote influence of the human on ESR do not disappear.

After mixing, molecular structures present within blood, maintain the changes caused by the previous influence of the subjective state of a person.

Highly significant unidirectional effects of changes in ESR were detected in a series of experiments with blood mixing after expressed subjective remote influence.



Legend: x-axis—background values ESR_c (mm) in each individual test in the control; y-axis—experimental values ESR_e (mm) in each individual test after subjective exposure, relative to the background value in the control— ESR_c . n—total number 49 of measurements in 31 subjects—healthy men aged 19 - 30 years with different blood groups and Rh. Blood: Rh - ○, Rh + ●. Significance of the difference in ESR in the control and after subjective exposure in Rh + blood $p < 0.0001$, in Rh - blood $p < 0.001$. — — an imaginary line on which experimental values ESR_e would be located, if they were equal to control values ESR_c : $ESR_e = ESR_c$. Above the line: $ESR_e > ESR_c$, below the line: $ESR_e < ESR_c$.

Figure 3. Changes in erythrocyte sedimentation rate (ESR) after exposure of blood in a tube to expressed subjective remote influence of the investigator.

The increase in ESR manifested itself in both Rh-positive and Rh-negative blood. The decrease in ESR, characteristic of Rh-positive blood, disappeared (**Figure 3**). It follows that after the mixing of blood, those effects that could be associated with a certain interaction and orientation of the red blood cells and blood proteins disappeared. It can be assumed that the expressed subjective remote state has different effects on the proteins of the red blood cells and blood plasma.

Unidirectional changes of ESR in both Rh-positive and Rh-negative blood also indicate a possible combined remote effect of the expressed subjective state of a person on various molecular structures in the blood, which we have already mentioned above. We can speculate that after mixing the blood, an effect of one of the factors associated with Rh-positive blood on ESR disappears, while there is still an effect of another factor.

Our findings indicate the existence of certain molecular factors present in the blood, which respond remotely to mental state of a person. We do not know yet, where the molecular structures of the blood, which are responsive to expressed

subjective state of a person, are located—in erythrocytes or in plasma. We hypothesize that these molecules may be proteins [21].

These results have defined a new area of research, which is focused on search and isolation from the blood of specific molecules, which are remotely sensor of the psychic state of a person.

4.1. The Brain Psychogenic Field

The results of the present investigations clearly demonstrate the existence of the remote-field effect of the expressed subjective state of a person. The mental state of a person can be remotely objectively registered. The contactless remote influence of the expressed subjective state can be realized only through the field created by the biological object itself—the human brain. We called this brain field a “psychogenic field”, because it reflects mental, expressed subjective state of a person [15] [22].

The nature of any field is determined by its action on the matter and by its influence on the processes. This is a common feature of all the known physical fields. There is no other way to detect the field and to describe its nature. All known field effects occur with maximum probability, which is reflected in our experiments.

It is now known that the psychogenic field of the brain causes the force acting on arrows of indicators; provides remote influence on physical properties of the blood and can be detected only by means of living structures. It is further possible that there are still some other, yet unknown to us, manifestations of this field.

The remote impact of the subjective state can be originated by the field generated by the biological object by the human brain itself. These findings pose question about the origin of psychogenic field, about the substrate that generates it, and about biological infrastructures it affects?

We guess that the generation of the psychogenic field and its remote effect can be associated with a change in the conformational structure of the brain proteins and with the quantum phenomena in them.

This is indicated by the following facts.

The development of the subjective state of the brain is accompanied by neurochemical rearrangements. Earlier, the possibility of changing the chemical sensitivity of neurons to neurotransmitters and peptides [23], also the change in the conformational structure of the receptor proteins of a brain neurons during emotional reactions were demonstrated [24].

We see various manifestations of the remote effect of the psychogenic field on ESR in the presence and absence of the Rh factor of a blood (**Figure 2**). Consequently, the remote action of the psychogenic field on ESR, in particular, is carried out with the participation of the Rh factor of a blood, which can change its conformational structure under the influence of the psychogenic field.

Changes in the conformational structure of proteins can lead to a change in the electrochemical properties of the blood, which in turn causes an ESR reaction.

Quantum phenomena are also characteristic of atoms that make up living

structures.

However, quantum phenomena depend on the nature of the biological compound: its composition, molecular weight, interatomic and intermolecular bonds. Therefore, we can talk about the specifics of a quantum processes in the complex biological structures.

These data suggest that quantum phenomena in the atoms of a brain protein compounds form the radiation of a psychogenic field with specific psychophysical properties.

4.2. A Hypothesis on the Field Mechanism of the Brain Psychic Activity

In the field of subjective brain activity, the major question arises: how the brain, which serves as a unique living structure, can in principle generate the subjective state or self-sensation? In other words, which should be the psychophysical organization to reproduce a subjective attitude to itself?

In literature there are a lot of works on the problem of subjective human brain activities. This includes philosophical articles; psychological in which external forms of mental activity are described; the clinical works considering violation of mental functions at various diseases; neurophysiological in which authors try to reveal correlates and codes of mental cognitive, sensory functions of a brain including by means of fMRT. However among them there are no articles on experimental studying of the nature (origin) of subjective brain activities.

Hypothesis connecting the emergence of the subjective state with the structure and function of neurons microtubules was proposed by S. Hameroff [25]. The author suggests that subjective state of a brain arises at quantum level of its organization, and the brain is the quantum computer. According to the author “brain processes relevant to consciousness extend downward within neurons to the level of cytoskeletal microtubules. An explanation for conscious experience requires (in addition to neuroscience and psychology) a modern form of pan-protopsyism in which proto-conscious quails are embedded in the basic level of reality, as described by modern physics”.

However these interesting theoretical views aren't supported with pilot studies and the evidence of their communication with subjective brain activities isn't produced. They don't allow to understand, how the brain, unlike computers and other lifeless systems, creates the internal subjective state, *i.e.* itself feels?

To understand the nature of a subjective state, it is necessary to imagine a principal circuit of the brain organization that can reproduce subjective self-perception.

We believe that this brain organization should generate specific field processes in the molecular structure, which produce a secondary effect on its neurophysiological mechanisms.

It is a well known fact that the electromagnetic field has a reverse effect on the generation and conduction of excitation in excitable cells (e.g., in neurons, nerves, and muscles). Using the neuron or muscle as an example, it can be shown that primary membrane ion fluxes generate the action potential (synaptic

potential). Due to the propagating field (electrotonic effect), they affect the adjacent electrically excitable structures and cause a progressive propagation of excitation. The electrotonic field influence can modulate nerve cell excitability.

E. Lents (1833), M. Faraday (1834) uncovered the existence of physical self-induction. I. Tasaki (1957) discovered on the electrotonic effect of field on excitable cells. Taking into account this data and results of our experiment, we proposed original scheme of the subjective brain state (**Figure 4** and **Figure 5**), which is based on the closed-loop field effects.

The electric physiology of excitable structures suggests that the electromagnetic field generated by a nerve cell affects the excitability and can cause excitation and conduction of a nerve pulse. We think that the fields generated by the brain produce reverse influence on the neurophysiologic mechanisms of the brain.

These processes illustrate a “*reverse effect*” of the field generated by nerve tissue.

Following the physical analogy we can call the reverse influence of the field on the structural and molecular processes in the brain as “brain self-induction”. In our opinion [22] neuronal brain structures are the “generator” of the psychogenic field and at the same time a “screen” that is affected by this field. It characterizes the closed cycle of the person’s self-perception of the processes occurring in neuronal structures of the brain (**Figure 5**).

5. System Organization of the Brain Psychic Activity

The theory of functional systems developed by P.K. Anokhin (1968) and presented in

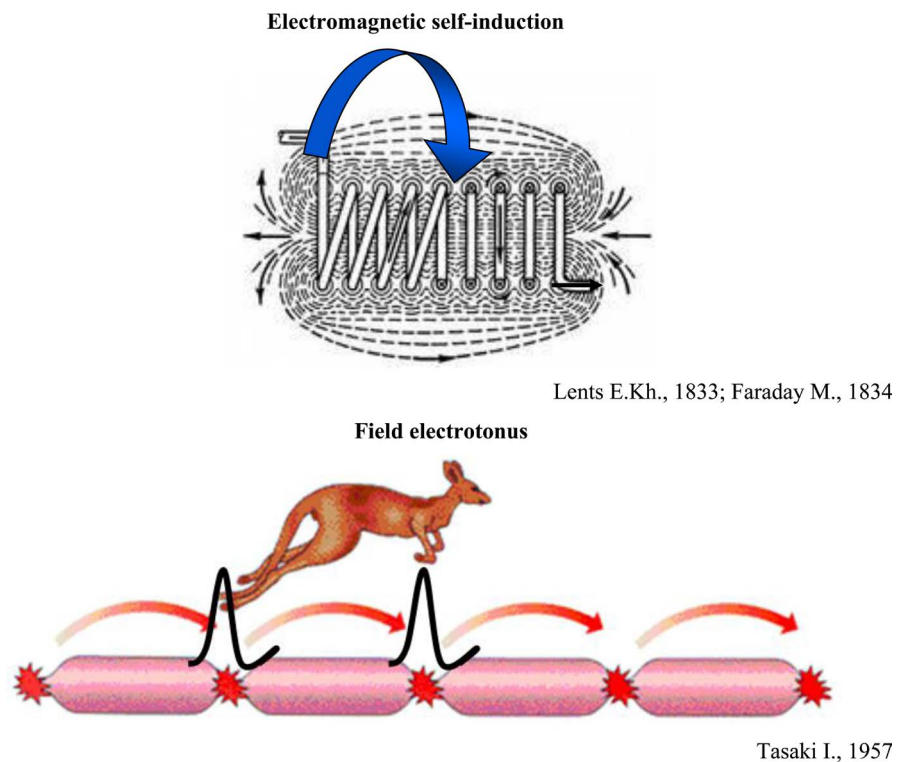


Figure 4. Closed-loop field effects. The signal is transmitted very quickly (400 km/h). Normal nerve, the myelin sheath is not injured.

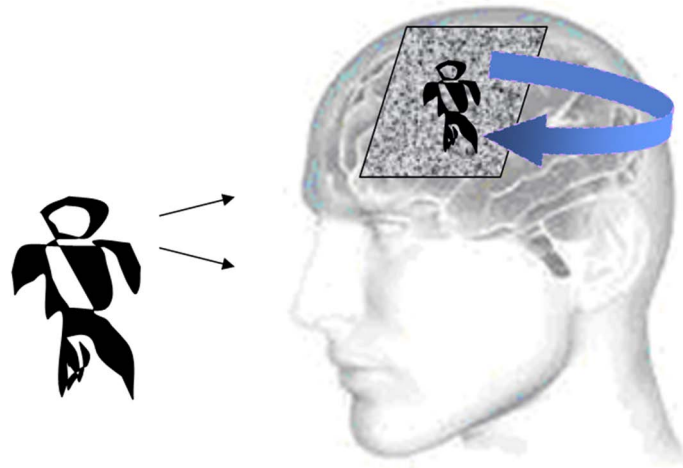


Figure 5. Self-induction in the brain. Hypothetical principal scheme for the formation of a subjective brain state. Reverse effect of the psychogenic field on neuronal molecular processes.

the works of K.V. Sudakov (2010) and many other researchers points at the main mechanisms in the brain activity, which may be associated with origin of emotions and thinking [10] [13]. However the central architecture of a behavioral act reflects only neurophysiologic component and fails to represent the organization of the subjective processes.

Presented by us functional system of the brain organization (**Figure 6**) has two subsystems: neurophysiological and psychic, interconnected and united in a single whole [22].

All processes in the brain start at the neurophysiologic level and then develop on the subjective level. At the first stage, the “afferential synthesis” goes on the neurophysiologic level, and then the process of analysis and interpretation continues on the subjective level—“subjective synthesis”, including the sensation of attraction (motivation), situational assessment, memorization and recall. The process is finished by decision-making and goal-setting made on the subjective level.

The further development of the processes in the brain may follow two ways.

In one case, the subjective synthesis finishes with the acceptance of an imagined mental result in the framework of subjective mental functional system.

In the other case, the decision about the goal-seeking behavior and goal-setting returns the processes from the subjective sphere to neurophysiologic level to formulate the program of result-oriented behavior and action results acceptor, in which the parameters of the future result are prognosed in accordance with the set goal.

If the prognoses and achieved results match, the process is stopped and a new stage of goal-seeking behavior without the participation of subjective level of the functional system is started.

If the prognoses and achieved results no match, the result acceptor initiates a “mismatch” or “surprise” reaction. The process goes to the subjective level where

2. The subjective level (feelings, consciousness, thoughts, emotions, etc.)

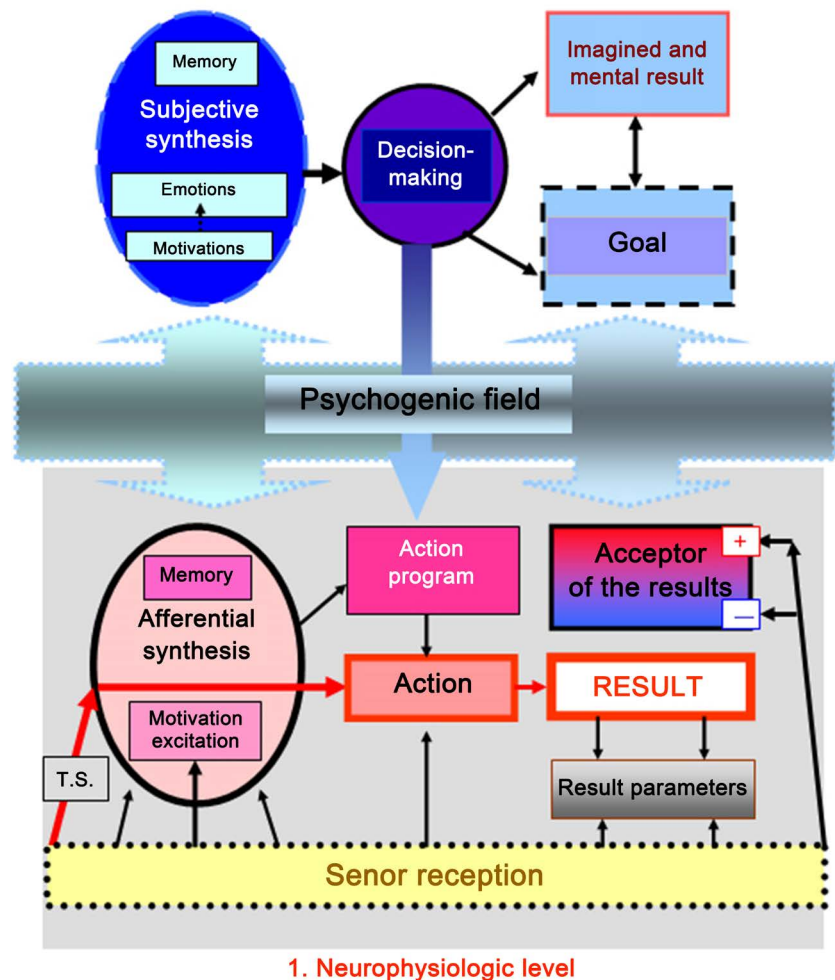


Figure 6. Scheme of the functional system organization neurophysiological (1) and mental activity (2) of the brain. Abbreviations used in figure: T.S.—trigger stimulus.

negative or positive emotion is generated depending upon the failure or no-failure to achieve the goal.

The positive emotion produces satisfaction and fixation finishing a specific behavioral act. The negative emotion mobilizes the process of subjective synthesis to search another more appropriate decision that will allow achieving the goal.

The emotions are the means of memory fixation of the whole bunch of factors promoting or hindering achieving the goal. At the neurophysiologic level, new emotions are transformed into emotional reactions of the body. The behavior is oriented along the common vector from a negative reaction to a positive one.

The emotional reactions are formed in the neurophysiologic part of the functional system, while the emotions and thoughts are produced in the subjective part.

Memory has the following two components: the neurophysiological component, and the subjective component. The process of memorization occurs at the

neurophysiological level, which involves subjective activity of the brain. The process of data storage in memory proceeds at the neurophysiological level with no involvement of subjective perception. Reminiscence and information retrieval from memory always involve subjective (intellectual) activity of the brain.

In essence, modern studies of memory are limited to the neurophysiological mechanisms. The mechanisms of memory cannot be evaluated without studying the subjective sphere. Hence, the process of information retrieval from memory is yet unknown.

At the neurophysiologic level, the tailored reflex reaction and automatic behavioral acts are performed due to preoperational integration, which is formed earlier (Yumatov, 2013). In these cases, the behavioral choice takes place without the participation of consciousness.

The major mental functions of the brain, including the freedom of will, goal-setting activity, choice of the behavioral strategy, expected (imagined) result, and assessment of goal achievement, occur at the subjective conscious level.

Consciousness is a subjective, mental activity characterized by the ability of the brain to sense itself, which manifests: feelings, emotions, thinking, associated with predicting and assessing the achievement of the goal.

Undoubtedly, without the knowledge of the origin of mental activity ideas about the brain are extremely limited, and very far from the truth.

The brain has two interrelated mechanisms of perception of the external environment and its own internal state of the organism. The first of these is performed by known neurophysiological processes. The second is subjective, characterized by the presence of a brain “screen” of one’s personal “I”, in which all informational content of the surrounding and inner world is manifested, felt and realized.

We assume that the relationship between the neurophysiological and subjective spheres of the functional system of purposeful behavior is realized through a psychogenic field.

The neurophysiological processes are source of the psychogenic field formation, and its subjective expression occurs in the mental sphere of the brain.

6. The Paradigm of the Brain Psychic Activity: Basic Postulates

The science lacks any paradigm about the origin of a psychic state besides common view that a mental activity is in a way originated in the neurophysiologic processes.

Historically the biological science developed based on the knowledge and achievements of abiocoen physics. As for the physical laws of living brain, these laws were overlooked by the traditional physicists and biologists.

The presented scheme and paradigm of systemic organization of psychic activity of the brain are a prerequisite for the subsequent development of the theory consciousness.

We came to the basic postulates given below, which characterize interrelation

of psychic and neurophysiological processes in a human brain [22].

- The origins of a psychic state are in basic properties of the living brain, which serves as a particular form of matter and has the proper physical laws and specific brain fields.
- The functional system of goal-directed behavior has two interrelated levels of brain organization (neurophysiological level and psychic level) and represents a united integral systemic structure.
- The psychic state of the brain results from interaction and interrelation of neurophysiologic processes and brain-specific biological fields (“psychogenic field”).
- Only living structures can have a subjective, mental state.
- The biological fields produced by the brain can directly affect the structural and functional processes in the brain (“biological self induction”).
- Psycho neurologic diseases can primarily occur in the subjective processes and secondarily manifest themselves in various structural and functional disorders.
- Living brain physics is a new field of science analyzing unique physical phenomena characteristic only to a living brain and non-existent in abiocoen.

7. Summary and Outlook

The results of the present investigations clearly demonstrate the existence of the remote-field effect of the subjective state of a person. We called this brain field a “psychogenic field”, because it reflects mental, subjective state of a person.

Our findings indicate the existence of certain molecular factors present in the blood, which respond remotely to mental state of a person. As a hypothesis, we assumed that such molecules can be proteins that change their conformational properties under the influence of pronounced subjective states.

These results have defined a new area of research, which is focused on search and isolation from the blood of specific molecules—“psychic sensors”, which respond remotely on subjective state of a person.

At the present time in science five fields are known: gravitational, electromagnetic, strong and weak, and space field “dark energy”. Various physical fields exist in the human body. The psychogenic field [22] of the brain is a field previously unknown and existing in a living organism.

The origin of a subjective state is in the fundamental properties of a living brain, which is a specific type of matter and has its own physical laws and specific brain fields.

The psychic activity is a phenomenon, function, state of brain, which, we think, emerges in the interaction of structural and molecular (neurophysiologic) and field processes in a living brain. The relationship between the neurophysiological and subjective spheres of the brain activity is carried out in the field form.

In our opinion, neuronal brain structures are the “generator” of the psychogenic field and at the same time a “screen” that is affected by this field. It cha-

racterizes the closed cycle of the person's self-perception of the processes occurring in neuronal structures of the brain.

The most important prospects in the cognition of the brain mental activity are:

- 1) study of the various properties and manifestations of the psychogenic field;
- 2) research of the influence psychogenic field on molecular living structures;
- 3) identifying of the biosensor of the psychogenic field and use it for the device controlled by mind;
- 4) development of the information technology for the detection of the brain mental activity.

Disclosure of the nature of mental activity will enable to understand the unique capabilities of the brain, open up fundamentally new information technologies for the transmission of signals and control in various spheres, the scale, of which is currently difficult to imagine and overestimate.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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