HSOA Journal of
Brain & Neuroscience Research

Review Article

Formation of Human Higher Nervous Activity and New Biological Theories

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Abstract

The article highlights the genetic mechanisms underlying the process of cell differentiation in the multicellular organism and the formation of the higher nervous activity in humans. The role of the main and acquired genome is focus on as well. Adduced are the results of the research relating to various significant, yet unsolved biological issues. Proposed is a new nano-model theory of the genome's functionality according to which the DNA molecule retains biological information not only in the form of the genetic code consisting of the nucleotide sequence, but also as a spatial-structural organization.

Keywords: Acquired genome; Brain; Higher nervous activity; Human genome; The main genome; Viruses

Introduction

The genome is an aggregate of the hereditary material contained in the cell of the body. The genome contains the biological information necessary to build and maintain the body. Most of the genomes, including the human genome and the genomes of all other cellular life forms, are built from DNA. There is also another definition of the term "genome", in which a genome is understood as meaning the aggregate of the genetic material of a haploid set of chromosomes of a given species.

According to classical data the hereditary material of the somatic cell in man (*Homo sapiens*) is represented by 23 of chromosome pairs (22 auto some pairs and a pair of sex chromosomes) located in the nucleus and the cell also has multiple copies of mitochondrial DNA. 22 autosomes, sex chromosomes X and Y, human mitochondrial DNA together contain about 3.1 billion base pairs [1].

In many species, only a small part of the total genome sequence encodes proteins. Thus, only about 1.5% of the human genome consists of protein-coding exons (DNA segments whose copies make up mature RNA), and more than 50% of human DNA consists of non-coding repeating DNA sequences. The reasons for the presence of such a large amount of non-coding DNA in eukaryotic genomes and the huge difference in the size of genomes (C-value) is one of the unresolved scientific mysteries; research in this area also indicates a large number of relict virus fragments in this part of the DNA.

The role of "junk DNA", evolution of genome, difference between individuals, process of cellular differentiation in multicellular organisms, formation of functions of higher nervous activity of man, and many other questions are still awaiting their solution through intensive studies at the world`s laboratories. The purpose of this article was to provide the scientific community with certain information shedding light on some of the above "mysterious" aspects of modern science.

Based on the results of our scientific article on the true location and role of viruses in nature [2], we present our classification regarding the main and acquired genome, our nano-model theory of genome functioning [3], and also discuss the processes of cell differentiation in multicellular organisms and the formation functions of higher nervous activity in humans. But first, let me briefly present the results of our foundational article on viruses. This is very important for the correct understanding of the further material of a scientific article.

True place and role of viruses in nature

Viruses are one of the greatest mysteries of modern biology. Due to modern concepts virus (Latin virus – poison) is a cellular infectious agent which be reproduced only inside the living cells. Viruses damage all types of organisms from plants and animals to bacteria and archaea. About 5-6 thousand of species of viruses has already been described, though it is supposed to be more than one hundred million. Viruses are found almost in every ecosystem on Earth, they are the largest biological form. Viruses are accepted to be the obligate parasites, because they can't multiply outside the cell [4,5].

However, taking into account the current level of knowledge in different fields of science, there is an urgent need to review some fundamental concepts of the true role and place of viruses in nature, since the author of the given article strongly disagrees with the name and definition of these creatures. Thus, meta-analysis of various reliable scientific data has been carried out, since 1892.

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Citation: Sargsyan VR (2018) Formation of Human Higher Nervous Activity and New Biological Theories. J Brain Neursci 2: 004.

Received: October 27, 2018; **Accepted:** December 09, 2018; **Published:** December 20, 2018

For the first time in 1892, the Russian scientist DI Ivanovsky proved the existence of the virus (as a new type of agent diseases). After long years of investigations of tobacco plants diseases (in the work dated 1892) DI Ivanovsky concluded that tobacco mosaic disease was caused by "bacteria passing through the Shamberlan's filter. However, they are unable to grow in artificial substrates".

Thanks to these data, criteria have been were determined according to which the agents of diseases had been applied to this new group: Filterability through "bacterial" filters, inability to grow in artificial subtracts simulation of the disease by filtrate, free of bacteria and fungi. The causative agent of mosaic disease was called differently by DI Ivanovsky. The term "virus" has not been introduced yet, allegorically they are called either "filterable bacteria", or simply "microorganisms"[4,5].

Five years later, during the study of diseases of the cattle, namely, foot and mouth disease, similar filtering organism was revealed. In 1898, during the performance of DI Ivanovsky tests such microorganisms were called "filtering viruses" by botanist M Beyeriner. In abbreviation this name appeared to indicate the given group of microorganisms. In 1901 the human's first virus disease-yellow fever was discovered. It was discovered by the US military surgeon W Reld together with his colleagues.

In 1911, Francis Rouse proved the viral nature of cancer-*Rouse sarcoma* (only in 1966, 55 years later he was awarded by the Nobel Prize in Physiology and Medicine for this discovery).

If we understand the true place and function of viruses in nature then it will be possible to study the fundamental foundations of the life and its manifestations.

So, eight new theories have been developed (Table 1).

1	Viral theory of electro-magnetic reception
2	Viral theory of bio communication
3	Viral theory of signal transduction
4	Viral theory of the functioning of immune system
5	Viral theory of functioning of the cell energy system
6	Viral theory of perception of information
7	Viral theory of formation of long-term memory
8	Viral theory of functioning of the somatic nervous system

Table 1: Viral theories each of them shows one of the functions of viruses in nature.

The main goal of the above-mentioned article is to introduce the diversity of the functions of viruses in nature to the scientific Association. A detailed description and reasons of each function (theories) of viruses will be given in our further scientific publications. Each virus theory will be the subject for separate scientific article.

Before the description of these theories, several research data are shown which confirm the validity of our viral theories.

1. Today about 5-6 thousand species of viruses is identified and investigated, though the existence of more than one hundred million is assumed. Why do we need such an enormous biodiversity of these creatures? The answer to this question will be given in description of our theories. We can only state that the nature creates nothing in vain.
2. Viruses are characterized by special disjointed (disjunctive) way of reproduction the nucleic acids of viruses and their proteins are separately synthesized in the cell then they are assembling into viral particles. The created viral particle is called virion.
3. The genetic apparatus of the viruses is very labile, they can easily mutate and due to it, change their "behavior".
4. Viruses are widely spread, they are capable of infecting virtually all representatives of flora and fauna and even microorganisms. Most viruses have free access to one or many types of cells of various cellular forms of life.
5. There are 5×10^7 bacteriophages per milliliter of ocean water.
6. According to authoritative and reliable data, 1/3 of human genome consists of the so-called "junk-genes" ("non-coding DNA"). It is also known that this is a space where viruses are embedded.
7. Genome is the basic biological information requested to build and maintain the body. It is known that there are 100.000 DNA fragments of endogenous retroviruses in human genes. They constitute 5-8% of the human genome.
8. Viruses, their factually derivatives and closely related structures constitute at least 43% of human genome.
9. According to British researcher Dr. Frank Ryan's statements and the latest research data the human genome consists of half of DNA viruses. "In fact, the human being is a product of symbiosis, that is, actually in regard to peaceful coexistence of the human and virus", says Frank Ryan. "There would not be humanity without them. Otherwise we would be completely different".
10. It is known that even in a healthy organism a number of virus's lives not causing special damage to it.
11. Due to the activity of viruses the process of fertilization and formation of the human's placenta is successfully realized. Actually, we are indebted to the functioning of viruses for our existence as a biological species.
12. Why the function of long-term memory is not developed for the children up to a certain age? The fact is, that only at the age of 1-2 years of life a person has a necessary arsenal of viruses, a viral composition which makes it possible for him to realize this unique opportunity to remember and archive information for a long time. Virom is unique for each person and the individuality of cognitive abilities of each person can be explained by it.

Thus, it can be concluded, that viruses are migrating organelles of cells. Actually, they are the part of us-cellular forms of life and perform numerous functions. Viruses are not independent forms and it is testified by cellular theory. Three tenets to the cell theory are described below:

1. All living organisms are composed of one or more cells.
2. The cell is the basic unit of structure and organization in organisms.
3. Cells arise from pre-existing cells.

The first of these tenets is disputed, as non-cellular entities such as viruses are sometimes considered life-forms. However, according to our viral theories the cellular theory is scientifically quite sustainable. Below, our virus theories are presented confirming the mentioned conclusion.

For this scientific article it is important to present in detail only three viral theories.

Viral theory of perception of information

Viruses of people, animals and other organisms play basic role for the perception of information. The information received from the sense of organs (receptors) is transferred to the central nervous system, where it is presented in the form of electrical impulses. The process of electrical activity in the central nervous system causes the formation of a certain sequence of DNA nucleotides of viruses (organelles of cells), changing their configuration. Thus, nano-models of various objects are created in the brain by the receptors of organisms. The human being has also an opportunity for imaginative thinking. Each thought can be corresponded to one specific "virus" and the emotion is already appeared to be the whole group of "viruses a ready-made virus" or its group from outside (thoughts or emotions of another organism) can often penetrate into the brain, so carrying out bio-communication, it can be confirmed by the known fact the viruses are capable to control the consciousness of various species of animals and human. Then pre-conditions are created for the formation of long-term memory.

Viral theory of the formation of long-term memory

The process of constant electrical activity in the central nervous system during reverberation causes the formation of structural changes in DNA or RNA (bio-communicators) of the human and animal viroma. All changes occurring in neural reactions have been called consolidations and the viruses are material bearers of the information entering into a long-term memory. Then the expression of these viruses extracts the information from a long-term memory. In the human body the function of information bearer for a long-term memory is performed by Herpesviruses.

Herpesviruses [Latin Herpesviridae] constitute a large family of DNA viruses by means of which the majority of the population of our planet is infected. According to the information of May 2016, about 86 species of viruses have been registered in the International Committee on Taxonomy of Viruses (ICTV).

The peculiarity of the viruses of this family is the discovery of the virus in the cells latently persisting, endless (unlimited) long time without clinical manifestations. So, according to our described theories at this time they fulfill the most important functions of the higher nervous activity of human being.

Viral theory of the functioning of somatic nervous system

Viruses of the human and animal body play a basic role for transformation of the will and intentions of the organism into movements. All accepted skills (gained skills) of the organism during the life are accumulated as a sequence of nucleotides of DNA viruses (bio-communicators) of virom in a long-term memory of humen and animals. Later if requested the expression of these genes occurs.

Due to the above-described molecular mechanisms in the body, it is possible to perform motor and speech activity and, actually, to subordinate the functioning of somatic nervous system to its will. Thus, relying on the above-mentioned, we propose to substitute the term "virus" for "bio-communicator" which, in fact, complies with their functions best of all.

Main and Acquired Genome

The main genome is a collection of all genes received by the body from the egg and sperm as a result of fertilization (nuclear, mitochondrial, plastid). This is a vertical gene transfer. Acquired genome is a combination of all genes obtained by the body during the embryonic and postembryonic periods from migrating organelles of cells (bio-communicators) in the form of DNA and RNA molecules. It is worth noting that the acquired genome can be formed also on the basis of the available genes (bio-communicators) impacted by the electrical processes going on in the nervous system of the body (see viral theories of the perception of information, formation of long-term memory, and functioning of the somatic nervous system) that take place due to the activity of the sensory systems of the body. Electromagnetic radiation (for example, the ultraviolet radiation spectrum) of natural and artificial origin also has an important effect on the formation of the acquired genome. For details, see the viral theory of electro-magnetoreception.

In fact, it turns out that all changes occurring in the external and internal environment of the organism are fixed (cause changes) in the acquired genome. Those that are important are stored in reserves of the body's long-term memory. This is a horizontal gene transfer. The acquired genome is individual for each somatic cell. If the process takes place in gametes, then genes of endoviruses are formed [4,5], which, as is known, is inherited from generation to generation.

According to the above information about the acquired and main genomes, a new definition of the term "phenotype" can be given. Phenotype is a manifestation of a set of genes obtained by vertical and horizontal channels of gene transfer and the result of their interaction. Consequently, the phenotype is the expression (manifestation) of the genotype. Naturally, in this regard the combinational and mutational variability are also conducive to the organism during the whole life from the moment of fertilization of the egg (formation of zygotes) to death has the ability to enrich its genotype due to an increase in the share of the acquired genome. This comes about through the horizontal transfer of genes. The information received by sensory systems (receptors) of the body on the internal and external environment actively affects the changes (enrichment or empoverishment) of body`s acquired genome.As a result, the phenotype changes. However, these changes affect only the genes of certain cells of certain tissues of the body. For example, cells of the Central Nervous System (CNS) of a person or animals, the immune system, or liver cells change. If the changes affect the germ cells, the new signs and properties will be inherited, from generation to generation.

According to the additional postulate of the cell theory, cells of multicellular organisms are totipotent, that is, they have the genetic potential of all cells of a given organism, are equivalent in genetic information, but differ from each other by different expression (work) of different genes, which leads to morphological and functional diversity-to differentiation.

The opinion of the author of this article is fundamentally different from the above additional position of cell theory. Bearing in mind that there is an acquired genome (except for the main one)-cells in the process of ontogenesis of an organism already become not equivalent in genetic information and therefore differ from each other not only by different expression of different genes, but also by different gene set of the acquired genome.This is essential for the morphological and

functional diversity (differentiation) of cells. It is a prerequisite for the emergence of highly specialized cells of multicellular organisms (in humans, for example, during the prenatal and post-notal periods of ontogenesis). This feature is not taken into account by many bio-engineers in obtaining tissues and organs in vitro for their further use for medical purposes (transplantation of tissues and organs) and therefore cannot receive fully functioning and suitable for transplant recipients many types of human tissues and organs.

To date, more than one scientist in the world has failed to obtain the human brain in vitro, and it will never work out if the presence of the acquired cell genome is not taken into account. Because in complex functioning organs (for example, the brain), horizontal gene transfer plays a key role. Thus, taking into account our classification of the genome into the main and acquired one, it is possible to achieve a complete understanding of the various biological processes occurring at the genetic, cellular (biochemistry) and bodily (physiology) levels of organization, in normal conditions and with various pathologies. Not to mention the enormous prospects opening up for bio-engineers.

Brain plasticity and genomic plasticity

According to the above, the genome of the organism is an actively and dynamically developing system throughout the entire period of ontogenesis. But in order to make this thesis more convincing, we give below an analogy with the plasticity of the human brain. Neuroplasticity is a property of the human brain, consisting in the ability to change under the influence of experience, as well as to restore lost connections after damage or as a response to external influences. This property is described relatively recently. Previously, it was generally accepted that the structure of the brain remains unchanged after it is formed in childhood.

The discovery of the fact that thoughts are capable of changing the structure and functions of the brain, even in old age, is the most important achievement in the field of neuroscience over the past four centuries. Norman Doyd offers a revolutionary view of the human brain [6].

The brain consists of interconnected nerve cells (neurons) and glial cells. The process of learning can occur through changes in the strength of connections between neurons, the emergence or destruction of connections, as well as the process of neurogenesis. Neuroplasticity refers to the processes of bond formation/destruction and neurogenesis.

During the 20th century, it was generally accepted that the structure of the brain stem and the neocortex remained unchanged after the formation was completed in childhood. This meant that learning processes there can only go through changes in bond strength, while areas responsible for memory processes (hippocampus and dentate gyrus) and retaining the ability to neurogenesis throughout life are highly plastic. This opinion changes under the influence of new research results, which state that the brain retains its plasticity even after the childhood period.

Neuroplasticity can manifest itself at different levels, starting from cellular changes in the brain, up to large-scale changes with reassignment of roles in the cerebral cortex, as a response to damage to specific departments. The role of neuroplasticity is widely recognized by modern medicine, and also as a phenomenon used in the development of memory, training, and restoration of the damaged brain.

The idea of "plasticity" of the brain was first proposed by William James in 1890, but it was not given any importance for the next fifty years. The term "neuroplasticity" was first introduced by the Polish neurophysiologist Jerzy Konorski. One of the fundamental principles of neuroplasticity is the phenomenon of synaptic pruning: The brain is constantly undergoing the process of destruction and the creation of connections between neurons. Recall that synaptic pruning ("neuronal pruning", eng. Synaptic pruning) is a reduction in the number of synapses or neurons to increase the efficiency of the neural network and remove redundant connections. Pruning includes both pruning of the axon and dendrites.

Thus, scientists are a little late, but still came to the conclusion about the existence of neuroplasticity in nature. Why not accept the fact of the plasticity of the genome (the processes of the emergence/destruction of genes in the process of ontogenesis of the organism) and with the help of such an understanding of the underlying biological processes explain the numerous processes occurring in nature and which are the "mysteries" of science. I propose to geneticists not to make "mistakes" of neuroscientists and timely review and decide on the question of the plasticity of the organism's genome, which will certainly have a huge impact on the development of the biological sciences and numerous practical areas of knowledge.

Nano-model theory of genome functioning

According to our nano-model theory of the functioning of the genome, the DNA molecule stores biological information not only in the form of a genetic code consisting of a sequence of nucleotides, but also in the form of spatial-structural organization. This means that the information component lies not only in the primary structure of the organization of DNA molecules, but also in structures II and III. This is actually a kind of biological nano-layouts.

A similar function in nature, to some extent, can be performed by RNA molecules, as well as protein molecules. DNA contains information about the structure of various types of RNA and proteins. But this does not mean that the DNA molecule does not have the ability to independently carry out numerous biological functions that ensure the vital functions of living systems [3].

Differentiation of cells in multicellular organisms and formation of the functions of higher nervous activity

If we take into account that the organism (cell) has the main and acquired genome, then this fact sheds light on many, currently, unresolved scientific issues and, first of all, on aspects of the genetic level of the organism's development. In turn, it becomes clear how and by what molecular mechanisms the differentiation of cells in multicellular organisms takes place in the process of individual development (ontogenesis). For example, the emergence of highly specialized functions in the neurons of the human brain and the manifestation of various functions of higher nervous activity already on the organism level, many of which are considered to be "secrets" of science even at the present stage of human development, are, for example, fully justified [7].

Therefore, it is not surprising that genetics who study the human genome are struggling to find the genetic features that led to an increase in the brain and, possibly, it's more efficient work. Special hopes are placed on comparing the human genome with the chimpanzee genome. This allows us to immediately exclude from consideration those 98% of the genome that are identical in our species.

Somewhere in the remaining two percent, the secret of human uniqueness is encrypted. It remains to understand exactly where and how.

Immediately after reading the genome of the chimpanzee genetics, friendly ranks rushed to storm the "Eternal Secret" of human uniqueness. Publications dedicated to identifying the unique genetic features of *Homo sapiens* are becoming more frequent, and it seems that a little more-and something very important will be revealed to us. And in fact, even today, the biological theories proposed by us are capable of explaining all this in a scientifically sound manner.

The behavior and mental abilities of a person are at a qualitatively new level in comparison with monkey. It is reasonable to assume that these differences are of a genetic nature. As a result of serious research, scientists have proved that the origin of man did not show a universal and large-scale accumulation of amino acid changes in the genes involved in the work of the nervous tissue [8,9].

But we are still smarter than chimpanzees and we have bigger relative brain size! "Apparently, the development of our mental abilities is encoded by a very small number of genes (a change in their sequence or level of expression), and these changes do not affect the average characteristics for all genes of the nervous system" [8,9]. These researchers arrived at similar conclusions.

And according to our proposed classification of the genome on the main and acquired (based on our viral theories) and the nano-model theory of the functioning of the genome, all this can be explained very logically and scientifically grounded. The thing is that modern classical genetics study only the main genome of the body, that is, the genes obtained from the parent germ cells (egg cell and sperm cell). However, for the functioning of highly specialized cells (such as brain neurons)-those genes that were obtained from parents by vertical transmission (from germ cells as a result of zygote formation) will not be enough. According to our viral theories, for the full perception of information, the formation of long-term memory and the functioning of the somatic nervous system, the organism must additionally receive a specific set of genes through horizontal gene transfer. This normally occurs in the perinatal and postnatal periods of the individual development of the organism. In order for most of the highly specialized cells in the human body (or another multicellular organism) to begin to fully fulfill the functions they were intended-it is not enough just to "turn on" (express) certain groups of genes and "turn off" other groups of genes of the main genome. If everything were so simple, then geneticists would have long since found many genes from the main human genome, which are unique to us (the people) and distinguish us, for example, from monkeys. There is no doubt that the man is quite superior to other types of animals in his development. And these differences are due precisely to obtaining additional genes already in the process of human ontogenesis. The basic human genome only creates prerequisites (favorable conditions) for the realization of this most important process and for this, only a small number of genes are necessary. By the way, according to modern genetic studies, this is what distinguishes us, for example, from chimpanzees in the main genome.

Additional explanation and scientific substantiation of our scientific theories

The formation of higher nervous activity (and long-term memory) in humans is deterministic and is ensured by horizontal gene transfer. And therefore thanks to the acquired genome. Brain plasticity is also ensured by the above genetic processes. According to my scientific statement, brain plasticity is possible only with the plasticity of the genome.The classic scientific understanding of the ontogenesis and development of higher nervous activity of a person is erroneous and scientifically inconsistent. According to the classic view the ontogenesis and the development of our nervous system are determined by differential expression of genes that were inherited through vertical transfer of genetic materials. And the plasticity of our brain is also due to differential expression of existing genes rather than horizontal gene transfer. The scientific error of this explanation is as follows at the time of fertilization and the formation of zygotes, and therefore at the time of the vertical generation of genes, it was not yet known under what conditions the organism would live in the process of ontogenesis. Therefore, such an explanation of biological processes does not provide an understanding of the true mechanisms of brain plasticity. The same can be said about the human immune system. There is innate immunity, and there is acquired immunity (due to horizontal gene transfer in the process of ontogenesis). Because at the time of fertilization of the egg and the formation of zygotes it is not yet known in what conditions the organism will live. Therefore, it is not known what the immune system to give the body. The immune system, like the higher nervous activity of a person, is formed at the genetic level in the process of ontogenesis of an organism due to horizontal gene transfer. The main genome (vertical gene transfer) provides the conditions for the occurrence of these processes during ontogenesis. According to our biological theory, viruses (bio-communicators) are responsible for these processes.

Conclusion

- All living organisms are composed of one or many cells. And viruses are not independent life forms.
- Viruses are migrating organelles for eukaryotic cells.
- The function of bio-communicators for prokaryotic cells, such as bacteria, is played by plasmids. Plasmids-Mobile Genetic Elements.
- In nature viruses perform a number of vital functions: Electro-magnetic recognition, bio-communication, signal transduction. At the same time they are responsible for the functioning of immune system, functioning of the cell energy system, perception of information, formation of long-term memory and the functioning of somatic nervous system.
- The cell along with the main genome is inherent in the presence of the acquired genome.
- In the overwhelming majority of cases, the functioning of the genome is carried out on the basis of the activity of biological nano-models.
- The processes of cell differentiation in multicellular organisms, the formation of the functions of higher nervous activity in humans and many other biological phenomena are closely related to horizontal gene transfer during the ontogeny of the organism.
- Considering our classification of the genome on the main and acquired, as well as our nano-model theory of the functioning of the genome, it is possible to achieve a complete understanding of the various biological processes occurring in the genetic, cellular (biochemistry) and organism (physiology) levels of organization, under normal conditions and in various pathologies.

Consequently, we can talk about another revolution in biology, which will undoubtedly affect such practical areas as medicine, agriculture, bioengineering, ecology, psychology, sociology, and the like.

The Following is Offered

- The replace the term (virus) with (bio-communicator), the term which is more suitable for scientific sense.
- To include scientific field of virology into the scientific field of cellular biology or cytology.

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