Acta Scientific Biotechnology

Volume 3 Issue 1 April 2022

Short Communication

Information as a Coherent/Effective Investigation Concept/Strategy to Approach the Biotechnology Scientific and Technical Research

Florin Gaiseanu*

PhD, Science and Technology of Information Bucharest (Romania) and Barcelona (Spain)

***Corresponding Author:** Florin Gaiseanu, PhD, Science and Technology of Information Bucharest (Romania) and Barcelona (Spain).

Received: February 25, 2022

Published: March 24, 2022

Information is a powerful investigation tool in scientific and technical research. Although highly conveyed within the communication media through our microelectronic systems, laptops, smartphones, TV and radio receivers, able to improve the decision in operative management by big data analysis and prediction [1] and the diagnostic and treatment in healthcare field [2,3], little is really known however about information as a powerful tool of communication in the human body and living structures. As the bioscience/biotechnology on the entire evolutionary scale is practically an interdisciplinary domain by definition, involving medicine, biology, neurosciences [4,5], neurology and psychology in particular, gathering together physical and chemical concepts and models at microelemental/macrostructural level, the introduction of information science is still a delayed, but indispensable task in this top domain of investigation. That is why it is urgently necessary therefore to acknowledge and include the new results concerning the information role in the living organisms, allowing the modeling of the informational structure of the human organisms and of the living systems in general, as it is presented below.

The macroscopic properties of the multicellular organisms are the result of the cellular activities, inter-coordinated accordingly [6]. Information in human organisms can be defined basically as virtual/conceptual information and matter-related information, depending on the perspective from which the concept of information is used. All creative fields of human are the results of mind informational activity, working with conceptual information, communicated by writing, speaking and audio-visual media in specific languages, or symbolist tools in mathematics, physics, science in general and arts [5]. In our microelectronic/informational systems, the communication is carried basically by electronic currents, managed by specific microelectronic circuits to offer/reproduce us the input informational messages emitted/shared by the informational sources and transported by specific channels. It is therefore natural to include human in the informational systems category, not only receiving information, but also operating, creating and disseminating information. However, the specific communication mechanisms in the human body are based on matter-related information (performed by specific bio-informational micro-devices), including besides the electric (ionic K^+/Na^+) transport along the nervous axons as an electrical bio-device, the carrying processes by neurotransmitters within the synaptic gap between the neighbor nervous cells (a chemical informational device "patented" by nature), by means of peptides/proteins at the surface receptors (acting as a selective microcellular device) of the semitransparent cell membrane interface and intra-cell communication, culminating with the info-genetic communication between genes structures of DNA/RNA (deoxyribonucleic acid/ribonucleic acid respectively) and proteins, from nucleus to the cytoplasmic body of the cell, as a complex but effective info-structural bio-device [7-9]. Therefore, the concept of information treated from mathematical/statistical point of view applied/derived from the theory of info-transmission/communication in electrical systems – early proposed in terms of probability and binary (Bit) units [10], can be transferred/applied also to living organisms [11-13], independently on the information-carrying agents, if the signal/message can be perceived and interpreted adequately.

For this, it is to be observed that the typical processes of the info-communication in the human body are based on the binary

Figure 1. Schematic representation of the informational activity and info-architecture of the informational system of the human body.

YES/NO Bit-type mechanisms [5]: within the nervous system, the basic mechanism consists in "all or nothing" transmission of electrical pulses along the nervous cell and excitatory/inhibitory YES/NO opposite type of neurotransmitters in the synaptic gap, and the inter-cell communication is based on the interaction between the chemical info-agents and surface receptors of the cell semitransparent membrane, specialized to selectively accept only an agent with a suitable complementary structure, able to fit the receptor structure like a key in the frog. The nature of the neurotransmitters determines a specific mood/emotional state [14], triggered by a specific type of information [15], followed by a YES/NO ("Good/Bad") mechanism of acceptance/rejection, according to the decision criteria and personal experience [16,17]. The info-communication at the micro-structural level in the nervous cell is "expressed" therefore by a specific "vocabulary", consisting in the frequency of the electrical pulses and in the number of pulses, which further determine the type of the emitted (inhibitory/excitatory) competing neurotransmitters in the synaptic gap, which further determines the firing YES/NO process of the next nervous cell, connected in a distribution network of such binary signals [18], and a specific final effect at the macroscopic (psychic) level [5].

The human organism is connected to matter by the metabolic circuit, absorbing foods, air, water and eliminating the wastes [8], as well as the individual cells [6,9,19], and to information received from the environmental neighborhood, reacting as a function of necessities for immediate adaptation (Figure 1). The human organism, as well as the individual cell, is therefore a bipolar structure, needing both to consume specific materials to convert them in energy and microelements for body (re)generation, and information to accommodate to the dynamic environmental conditions. The info-communication from external and internal sources is centralized in the brain – the informational processor of the body. The green cross arrows in the upper side of figure 1 indicate symbolically the info-communication streams from the external sources to the brain (left-facing arrow), from internal sources to the brain (up arrow), from the brain to the body (down arrow) and from the body to the external environment (right-facing arrow). The brain is therefore an informational operative system, receiving (info-input) information from sensors (transducers bio-devices) and interpreting them, analyzing comparatively information (with respect to the memory-base data), and operating a decision (info-output), like an operative informational "device" [20,21]. The informational signals from sensors are transduced in electric-chemical signals at the info-perception interface, converted into detected signals at the info-detection interface in

the brain – according to the specific origin of the signals (sound, image, smell, taste, touch, or hunger, thirst, pain, etc.), and are interpreted finally by the significance "dictionary" of the language in conceptual/virtual information [5]. The integration of information from various sources is achieved in thalamus and transmitted to prefrontal cortex for analysis and decision, via anterior cingulate cortex, which selects (by a binary YES/NO process) the necessary information according to the priorities and needs of the organism [14], generating the personal awareness state – consciousness, on internal and external reality [5]. A special priority is granted to danger signals emitted by amygdala, an ancestral alarm "device" specialized in the detection of perilous/risky situations [23]. The sight informational circuitry for instance, more developed at human – engaging more than 50% of the cortex, is used both for the external perception and for the internal recalled imagery from memory [23]. At the detection interface, the image is "projected" on the sensorial mental "screen" in the prefrontal cortex, by a recomposing process of the image pixels, with less resolution if the image is recalled from memory [18].

Analyzing therefore the functions of the brain/body from the informational perspective, we have to observe the following fundamental components of the informational system of the human body (ISHB) (Figure 1 bottom side): the center of acquisition and storing of information (CASI), connected with the network of the external and internal sensors of information, consisting basically in the prefrontal cortex for short-term memory (about 1 minut**e)** and hippocampus for long-term memory (Figure 1 upper side): the center of decision and command (CDC), connected especially with CASI to recall the necessary information for analysis and decision making and with the executive elements (muscles) for action, supported especially by the cortex regions and in particular by the prefrontal cortex, the main zone of the judgment and headquarter of awareness; the info-emotional system (IES), managing the emotions and emo-states, including the alarm signals, supported by the limbic system (thalamus, hypothalamus, hippocampus, midbrain, amygdala), with active response of the heart for adequate blood distribution in the regions in momentary need; the maintenance informational system (MIS) supported basically by the medulla and brain stem connected with the cerebellum and spinal cord, with a fundamental role in the metabolic processes executed by the specific organs within the abdomen, in correlation with the cardio-respiratory activity; the genetic transmission system (GTS) managed by hypophysis and hypothalamus, coordinates the sexual activity and response; the info-genetic generator (IGG) is managed by the hypophysis and hypothalamus, regulating the development, growth and even aging [24]; the info-connection (IC) is supported mainly hy the anterior cingulate cortex, responsible for the selection of information from the inferior zones of the brain to the judgement prefrontal cortex, involved also in religion and mystic, and near-death experiences [7,25,26]. As it was recently shown [23], the posterior cingulate cortex is also involved in IC by the daydreaming experiences, acting as a disruptive YES/NO type connector of attention from external to the internal world. Hypothalamus acts also as a binary YES/NO homeostatic balance between the stimulatory and inhibitory body's key processes [5,27]. The connection of the brain regions with the body is assured by the spinal cord and nervous ramifications [28], which are the informational circuits of ISHB, schematically represented in the below side of the figure 1 by the vertical arrows and horizontal doted lines. As all the regions of the body are sensitive to information, the body itself can be defined as made up of informed matter. In the cell, the informational circuits are represented by the chemo-reactive pathways [9]. Organelles with functions like the organs in the human body can be distinguished in the eukaryotic cell [8,18], but the vital processes in the prokaryotic cell are similar, although the organelles are not separately enveloped in specific membranes. It is revelatory to note therefore that the informational model described above is the same or similar on the entire evolution scale of the living structures, from the individual cell – the unit base of life, to the multicellular organisms, with the human as a top representation [9,29].

According to the above presentation, the ISHB manages two main types of informational activities: (1) for the adaptation to the environment dynamic conditions by a reactive adequate response, expressed by attitude as an info-output, manifested by vocal and corporal "language", managed by the operative informational system (OIS=CASI+CDC+IES); (2) for the body present development/survival (IGG, MIS) and the long-term adaptation for species survival (GTS), managed by the programmed informational system (PIS=MIS+GTS+IGG),. A special role in the long-term adaptation is played by the epigenetic processes (represented by the top down big arrow in the left below side of the figure 1),

assuring the integration of insistent/repetitive informational cues from the external environment into the stable/reference genetic informational system of the cells, without affecting the species basic characteristics [30]. At the cell level, the info-communication is based on the matter-related informational transfer by means of a "language" in a specific four-letters "alphabet", from DNA sequences to proteins (the fundamental "bricks" of the body) through mRNA (messenger RNA) intervention assisted by enzymes during the transcription/translation processes, with the participation of the YES/NO algorithmic structural complementarity of the amino-acids, and during the replication/reproduction of the cell itself. This alphabet is represented by the nucleotides adenine (A), guanine (G), thymine (T), or cytosine (C) in DNA (with the variant uracil (U) in RNA instead of (T) in DNA), structured by YES/NO binary complementarity (A can be paired only with T (or with U in RNA), and C only with G in DNA molecules).

The projection (=>) of the activity of the ISHB components in the mind is perceived at the interface ISHB/conscious mind as cognitive centers, under the following form: CASI=>Iknow (Ik) (interpreted as memory), CDC=>Iwant (Iw) (decision), IES=>Ilove (Il – the driving force of life, representing symbolically the emotions [16,14], MIS=>Iam (Ia) (vitality, self-status, health, power), GTS=>Icreate (Ic) (biologic creation, sexual behavior, family, sociability [5,31], IGG=>Icreated (Icd) (inherited features and behavior, predispositions, abilities, talent), IC=>Ibelieve (Ib) (decision criteria, trust/beliefs, daydreaming, introspection [29]), schematically represented in figure 1 below side, as components of the self: I=Ik+Iw+Il+Ia+Ic+Icd+Ib. In other words, ISHB=(CASI+CDC+IES+MIS+GTS+IGG+IC) => I= (Ik+Iw+Il+Ia+Ic+Icd+Ib). From this relation we can deduce that I_A=/=I_B (I_A is different of I_B (Figure 1)), according to the individual (A, B) detection/interpretation abilities of reality and life experience.

This informational model, with the fundamental merit of the explicit revelatory reference to the constitutive/functional info-structure of the living systems, can be successfully applied to understand and explain various still remained problems in bioscience/biotechnology/biomedicine researches, like consciousness nature and neuro-relation with brain and body from informational perspective [4,32,34], the mind operability [6,23,26,35] and the info-relation with the heredity [36], the specific mind neuro-mechanisms and interrelation between the various zones of the brain with particular functions [22,32], the hierarchical info-assisted brain evolution [37], the neuro-dynamic of the mental aggressiveness [38], the addiction and mood disorder pathology and therapy [13], the mind-body equilibrium and health [39], offering a sharp definition of attitude and its quantitative evaluation [40,41], and neuro-rehabilitation therapy in the geriatrics dysfunctions [42]. This model can be also applied in biomedical engineering/biotechnology [19-21,29] and in the life science [8,18], facilitating the confluence with the actual mimic efforts to develop artificial systems with similar functions like the biologic structures, or to design and obtain mixt systems with complex architecture, following the achievements in the microelectronic technology [15].

Conflict of Interest

No financial or conflict of interests.

Acknowledgment

To my family, to Adrian Gaiseanu and Ana-Maria Gaiseanu.

Bibliography

1. Filip Florin Gheorghe. "DSS-A class of evolving information systems". In: G Dzemyda, J Bernatavičienė, J Kacprzyk (Eds.), Data science: New issue, challenges and applications. Springer (2020): 253-277.

2. Gaiseanu Florin. "Information in Biological Structures and Big Data Assisted Prediction as Informational Biostatistics/ Biometric Tool for Pandemic COVID-19 Investigation". *Annals of Biostatistics and Biometric Applications* 4.3 (2021): 1-3. ABBA.MS.ID.000592.

3. Lidong Wang and Cheryl Ann Alexander. "Big data analytics in medical engineering and healthcare: methods, advances and challenges". *Journal of Medical Engineering and Technology* 44.6 (2020): 267-283.

4. Gaiseanu Florin. "Solution to the Mind-Body Relation Problem: Information". *Philosophy Study* 11.1 (2021): 42-55.

5. Gaiseanu Florin. "Information, Info-Creational Field, Creativity and Creation, According to the Informational Model of Consciousness. In*ternational Journal of Neuropsychology and Behavioural Sciences* 2.3 (2021): 75-80.

6. Gaiseanu Florin. "Advanced Perspectives in Biological Researches: Info-Operability of the Cell and Human/ Multicellular Organisms". *Acta Scientific Biotechnology* 3.1 (2021): 1-5.

7. Gaiseanu Florin. "The Informational Model of Consciousness: Mechanisms of Embodiment/Disembodiment of Information". *NeuroQuantology* 17.4 (2019): 1-17.

8. Gaiseanu Florin. "Informational structure of the living systems: From philosophy to informational modelling". *Philosophy Study* 10.12 (2020): 795-806.

9. Gaiseanu Florin. "What is Life: An Informational Model of the Living Structures". *Biochemistry and Molecular Biology* 5.2 (2020): 18-28.

10. Shannon Claude (1948) A mathematical theory of communication". *Bell Labs Technical Journal* 27.379-423 (2020): 623-656.

11. Gaiseanu Florin. "Information-Matter Bipolarity of the Human Organism and Its Fundamental Circuits: From Philosophy to Physics/Neurosciences-Based Modeling". *Philosophy Study* 10.2 (2020): 107-118.

12. Gaiseanu Florin. "Evolution and development of the information concept in biological systems: From empirical description to informational modeling of the living structures". *Philosophy Study* 11.7 (2021): 501-516.

13. Gaiseanu Florin. "Information in the Universal Triangle of Reality for Non-living/Living Structures: From Philosophy to Neuro/Life Sciences". *Philosophy Study* 11.8 (2020): 607-621.

14. Gaiseanu Florin. "Pathological expression and circuits in addiction and mood disorders: Informational relation with the brain and info-therapy". *EC Neurology* 13.8 (2021): 1-12.

15. Gaiseanu Florin. "Physics of Consciousness and Life: The Informational Model of Consciousness – Information in Neurosciences, Biocomputers and Biosystems – Romanian version: Fizica Constiintei si a Vietii: Modelul Informational al Constiintei – Informatia in Neurostiinte, Biocomputere si Biosisteme. Editura GlobeEdit (2020).

16. Gaiseanu Florin. "Destiny or Free Will Decision? A Life Overview From the Perspective of an Informational Modeling of Consciousness Part II: Attitude and Decision Criteria, Free Will and Destiny". *Gerontology and Geriatric Studies* 4.1 (2018): 1-7.

17. Gaiseanu Florin. "Destiny or free will decision? A life overview from the perspective of an informational modeling of consciousness Part I: Information, consciousness and life cycle". *Gerontology and Geriatric Studies* 4.1 (2019): 1-7.

18. Gaiseanu Florin. "Informational Operability of the Brain: Novel Approaching Perspectives in Neuroscience and Neurology (Guest Editorial)". *EC Neurology* 13.12 (2021): 50-54.

19. Gaiseanu Florin. "Information as an essential component of the biological structures and their informational organization". *Journal of Microbiology and Biotechnology* 6.2 (2021): 1-9.

20. Gaiseanu Florin. "Human as an Informational Device". *Archives in Biomedical Engineering and Biotechnology* 6.1 (2021): 1-8. ABEB.MS.ID.000629.

21. Gaiseanu Florin. "New Perspectives in Biomedical Engineering and Biotechnology: Information in Human and Biological Structures". *Archives in Biomedical Engineering and Biotechnology* 6.1 (2021): 1-3. ABEB.MS.ID.000633.

22. Gaiseanu Florin. "Neuropsychological response to information of beauty/ugly brain circuits according to the informational model of consciousness". *International Journal on Neuropsychology and Behavioural Sciences (IJNBS)* 2.2 (2021): 55-59.

23. Gaiseanu Florin. "Info-Relational Cognitive Operability of the Posterior Cingulate Cortex According to the Informational Model of Consciousness". *International Journal of Psychological and Brain Sciences* 5.4 (2020): 61-68.

24. Zhang Y., et al. "Hypothalamic stem cells control ageing speed partly through exosomal miRNAs". *Nature* 548 (2017): 52-57.

25. Gaiseanu Florin. "Quantum-Assisted Process of Disembody Under Near-Death Conditions: An Informational-Field Support Model". *NeuroQuantology* 15.1 (2017): 4-9.

26. Gaiseanu Florin. "An Information Based Model of Consciousness Fully Explaining the Mind Normal/Paranormal Properties". *NeuroQuantology* 15.2 (2017): 132-140.

27. Robert M Sargis. "An Overview of the Hypothalamus The Endocrine System's Link to the Nervous System" (2021).

28. Gaiseanu Florin. "Informational Neuro-Connections of the Brain with the Body Supporting the Informational Model of Consciousness". *Archives in Neurology and Neuroscience* 4.1 (2019): 1-6. ANN.MS.ID.000576.

29. Gaiseanu Florin. "Advanced Results in Biological Researches: Informational Structure and Info-Operability of the Living Systems". *Journal of Biotechnology and Bioresearch* 3.3 (2021): 1-4. JBB.MS.ID.000561.

30. Gaiseanu Florin. "Epigenetic Information-Body Interaction and Information-Assisted Evolution from the Perspective of the Informational Model of Consciousness". *Archives in Biomedical Engineering and Biotechnology* 2.2 (2019): 1-6.

31. Gaiseanu Florin. "New Investigation Perspectives in Psychology and Behavioral Sciences: Informational Activity and Psychological/Behavioral Expression of the Cognitive Centers of Consciousness". *International Journal on Neuropsychology and Behavioural Sciences* 2.4 (2021): 99-102.

32. Gaiseanu Florin. "Informational Mode of the Brain Operation and Consciousness as an Informational Related System". *Archives in Biomedical Engineering and Biotechnology* 1.5 (2019): 1-7. ABEB.MS.ID.000525.

33. Gaiseanu Florin. "Information: from Philosophic to Physics Concepts for Informational Modeling of Consciousness". *Philosophy Study* 8.8 (2018): 368-382.

34. Gaiseanu Florin. "Informational Model of Consciousness: From Philosophic Concepts to an Information Science of Consciousness". *Philosophy Study* 49 (2019): 181-196.

35. Gaiseanu Florin. "Human/Humanity, Consciousness and Universe: Informational Relation". *NeuroQuantology* 17.5 (2019): 60-70.

36. Gaiseanu Florin. "The Silent Voice of Those Who are no Longer: Transgenerational Transmission of Information from the Perspective of the Informational Model of Consciousness". *Gerontology and Geriatric Studies* 5.1 (2019): 482-488.

37. Gaiseanu Florin. "Information Based Hierarchical Brain Organization/Evolution from the Perspective of the Informational Model of Consciousness". *Archives in Neurology and Neuroscience* 7.5 (2020): 1-6.

38. Gaiseanu F. "Mental aggressive operability from informational perspective: A deterrence manifesto". *EC Neurology* 13.4 (2021): 31-39.

39. Gaiseanu Florin. "Informationally-Assisted Equilibrium and Health: Specific ACC Contribution from the Perspective of the Informational Model of Consciousness". *EC Psychology and Psychiatry* 9.5 (2020): 37-49.

40. Gaiseanu Florin. "Attitude as an Expressible Info-Operational Reaction to a Perceived/Purposed Object/Objective". *International Journal on Neuropsychology and Behavioural Sciences* 1.1 (2020): 12-16.

41. Gaiseanu Florin. "Evaluating attitude and behavior: An info-operational procedure related/supported by the cognitive centers of mind". *International Journal on Neuropsychology and Behavioural Sciences* 2.1 (2021): 1-5.

42. Gaiseanu Florin. "Multitask Music-Based Therapy Optimization in Aging Neurorehability by Activation of the Informational Cognitive Centers of Consciousness". *Gerontology and Geriatrics Studies* 6.3 (2021): 621-625.