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The conception of consciousness from Metaphysics to Quantum Biology: Critical review

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Abstract

The definition of consciousness and its essential characterizations, has been known over the centuries different interpretations, with different approaches and points of view, philosophical, neurological, psychological, biological and quantum. Since none of the successive interpretations in previous years it is still satisfactory and conclusive, the research continues towards more daring and abstract theoretical proposals.

In this article I am going to try to collect some of the various lines of research, exemplifying current trends, in the specialized literature on the subject.

The different articles are grouped according to the conceptions and theories that unite them, and are critically examined by showing the inconsistencies within each of them and the antithetical logical conflicts that exclude them from each other, leaving the original enigma still unsolved: what is conscience?

I have devoted a more in-depth examination of quantum theory and quantum biology on this topic, highlighting the inconsistency of fundamental assumptions, compared to the consolidated knowledge of fundamental neurobiological structures and functions.

Keywords: Consciousness; Philosophy; Neurobiology; Quantum mechanics; Quantum biology

1. Introduction

One of the most debated and controversial topics of the human sciences is the concept of consciousness, because there are many definitions and hypotheses proposed by philosophers, physicists, biologists, neurologists, but so far none of these has met the unanimous opinion.

According to many Authors consciousness is an intrinsic property of universal matter that reaches its maximum expression in living organisms, thanks to which they are able to perceive external and internal stimuli for adaptation to their environment. One of the most debated and controversial topics of the human sciences is the concept of consciousness because there are many definitions and hypotheses proposed by philosophers, physicists, biologists, neurologists, but so far none of these has met the unanimous opinion.

Thus understood consciousness is the property that the living has to recognize their individuality, communicate it to their fellow men it and interact with each other and with their environment, to seek common answers in harmony with the overall system.

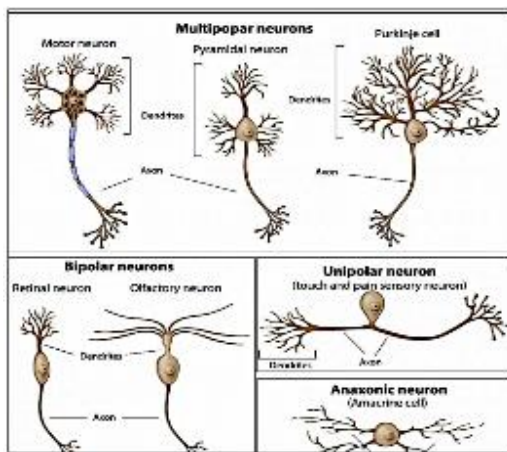
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Since consciousness depends on the general organization of the nervous system, which represents the biological substrate of its expression I briefly describe the fundamental cellular components from which it is formed and the reciprocal functional interactions.

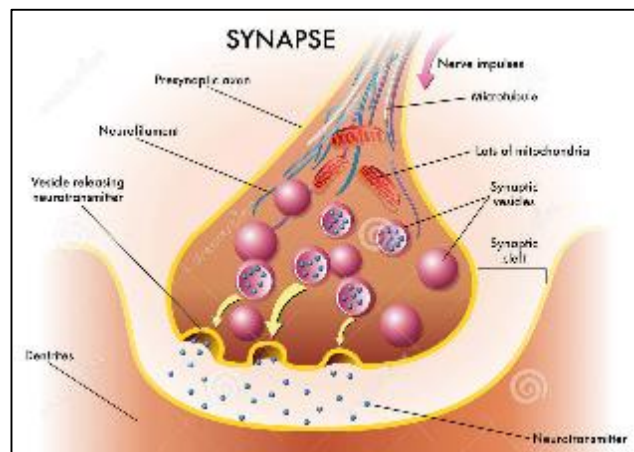
I am pointing out an excellent article by Feinberg and Mallatt in which they describe the evolution of the brain and consciousness, from simple to more complex organisms, and trace the fundamental stages phylogenetic and ontogenetic and the morphogenetic mechanisms underlying them, which in their investigation define Isomorphic or somatotopic neural representations [1].

The central nervous system of vertebrates is the most complex organ compared to all the others, the numerous cellular types from which it is formed, the neurons, that for shape and number exceed those of the whole organism, are a demonstration of this Fig. 1A.

Such structural complexity is indicative of the functions to which they are Members, the synapses have reached a branched shape such as to maximize the surface and contacts for each functional unit Fig.1B, and to exponentially amplify the number of possible interactions.



1A- By Dreamstime



1B- By Dreamstime

Figure 1 From Dreamstime - Neuronal types 1A and synaptic contacts 1B

Due to the formation of interconnected neuronal networks, the number of possible interactions is incalculable.

Moreover, there are different modes of synaptic interaction between neurons, with substances called neurotransmitters, which are specific depending on the different types of receptors and ion channels of neurons. Often the same neurotransmitters have different effects, inhibitors or exciters, on the same receptors Fig.2, on the right.

The main connections and nerve networks involved in the higher cognitive functions, consciousness, intelligence, thought, etc. demonstrate how high the degree of interaction and overall integration of the brain is Fig.2.

For example, the stimuli we perceive from the outside, visual, auditory, tactile, painful, etc. we receive through sense organs and sensitive pathways in specific brain areas, but then we recognize and decode the meaning and implications for our lives, in related cognitive cortical areas.

It is the complex set of areas and associative nerve networks that makes us conscious Fig.2.

From the foregoing we can understand how it is limiting the conception that attaches to individual neuronal circuits or to individual cellular structures, e.g. to the cytoskeleton, the efficient cause of such a complex function as that of consciousness, and how this depends rather on the integrated activity of the whole system.



Figure 2 From: DLF.PT -Brain, Neural network (Download Free)

2. The fundamental stages of research and the hypotheses on consciousness

One of the first authors to study and define the phenomenology of the consciousness was E. Husserl, who distinguished between transcendent consciousness turned to the perception of objects, opposed to the immanent perception that consciousness has of itself.

Since then, scientific research has sought to understand the intimate mechanisms of the fundamental processes of our universe, the living and the rules of their operation, and the rules of their functioning by the progress of science and technological evolution, investigations of such mechanisms take place at infinitesimal levels by isolating them from the systems and organisms to which they belong.

We find examples of this in quantum mechanics, in atomic physics, in molecular biology, that from the subatomic investigation of matter theorize the fundamental laws that govern it.

In particular, quantum mechanics produces theories based on complex mathematical formulas, which, by the admission of theoretical physicists themselves, fail to explain the properties and the intimate essence of matter.

Biology has recently undergone a profound evolution, from morphological, anatomical and cellular research, to molecular biology and now to quantum biology, which intends to grasp and interpret the elementary aspects of the living using the laws and postulates of quantum physics.

In the frantic search for the elementary structure of the living, and the laws that regulate its operation, the more infinitesimal and thorough is the level of investigation, the more evanescent and imaginative are the proposed theories.

As far as definition and theories of consciousness are concerned, entire libraries have been written, and endless definitions and interpretations of the phenomenon have been proposed, none of which has met with final approval. All these theories present the common epistemological ambition consisting in giving form and expression to a phenomenon incomprehensible in its essence.

The difficulty consists in understanding an immaterial human essence, observing it from the outside of ourselves and our fellow men, as if the observer were a foreign body with respect to the object of its speculation.

So despite the use of rigorous experimental methods and elaborate technologies, they will never be able to reproduce the infinite variations that manifest in nature.

In the article by Simon Hviid Del Pin et al [2] we find an interesting review of the theories present in the scientific panorama, and a critique of the divergent and discordant approaches in this field of research.

Moreover, as has been clearly pointed out by Florian Mormann and Christof Koch [3], in the description of the consciousness found in the literature there is often an erroneous overlap of properties that are completely different from the conceptual and neurophysiological point of view, For example, identifying consciousness with the state of

"attention" and "wakefulness", which instead are the essential functional substrate, so that consciousness manifests itself:

"There are two common, but quite distinct, usages of the term consciousness, one revolving around arousal and states of consciousness and another one around the content of consciousness and conscious states."

"To be conscious of anything, the brain must be in a relatively high state of arousal (sometimes also referred to as vigilance)." *Neural Correlates of Consciousness* From Scholarpedia, [2007], 2(12):1740.

A plethora of scientific papers have been written by several researchers on this subject, who have proposed different interpretations, depending on their cultural background.

The theory currently in vogue to describe the essence of consciousness is that offered by Quantum Biology, the most abstract among the biological sciences, which has borrowed the principles, the laws and formulas of quantum mechanics related to inanimate matter, to adapt them to the living with disconcerting results.

It often happens in describing an experimental result or a natural event, of which the origin and intimate succession of the mechanisms underlying it is not at all understood, to resort to a completely abstract interpretation, with the use of esoteric complex mathematical formulas, as usually happens for example in the "exact" sciences, mathematics and physics.

What is the nature and origin of this unfathomable function properly human, which we call consciousness, and how it makes us aware of our corporeity and makes us feel and know the surrounding world, remains a mystery, despite the infinite literature existing and the many hypotheses formulated on the subject.

In this article, I critically examine the different theories of quantum biology present in the literature and applied to the understanding of consciousness, with the aim of highlighting the numerous contradictions present between the different points of view.

To facilitate the exposition of the theories present on the subject, I divided the subject according to the different lines of research.

2.1. Metaphysical approach

From the historical point of view the first attempts to connote consciousness date back to the philosophical tradition, starting from the Greeks, until the Middle Ages and modern times.

The subject was addressed with a metaphysical and animistic approach, identifying consciousness as an immaterial entity or as a spiritual emanation of a Supreme Entity.

I remember among the main philosophers who dealt with matter, Plato, Aristotle, Descartes, Thomas Aquinas, and among scientists Sigmund Freud, John Eccles, etc. and among scientists Sigmund Freud, John Eccles, etc.

These great philosophers and scientists have coined the definitions of consciousness either in a metaphysical, unscientific and devoid of demonstrative value, or with psychoanalytic-cognitive approach proved to be unfounded. In them the questions:

Where is this immaterial soul? What are its properties? How does it work?

They found no satisfactory answers.

2.1.1. The mysterian approach

According to the Religious-Mystery tradition Science will never be able to explain consciousness, because

consciousness is pure illusion our common sense ideas about consciousness are just an artifact of illusions, language, social constructions and learning. See Daniel Dennett [4].

2.2. Classic neurobiological approach

In the last century the foundations were laid for an experimental approach of general Neurology and higher cognitive functions, to which consciousness is also attributable [5].

Even today, in the most recent works of eminent neurobiologists, we are trying to describe consciousness as an expression of the same neuronal circuits and synaptic/neurotransmitter circuits, which underlie the functions of other more elementary central and peripheral neurological functions [6-7].

Complete the essential information on the nervous system, already described above, with a recall of the preliminary concepts of nerve conduction and synaptic transmission as essential properties to understand the functioning of the nervous system.

Nerve conduction and synaptic transmission use protein structures such as molecular pumps and ion channels present in the cell membranes of neurons, axon fibers and synapses Fig.3 [8-15].

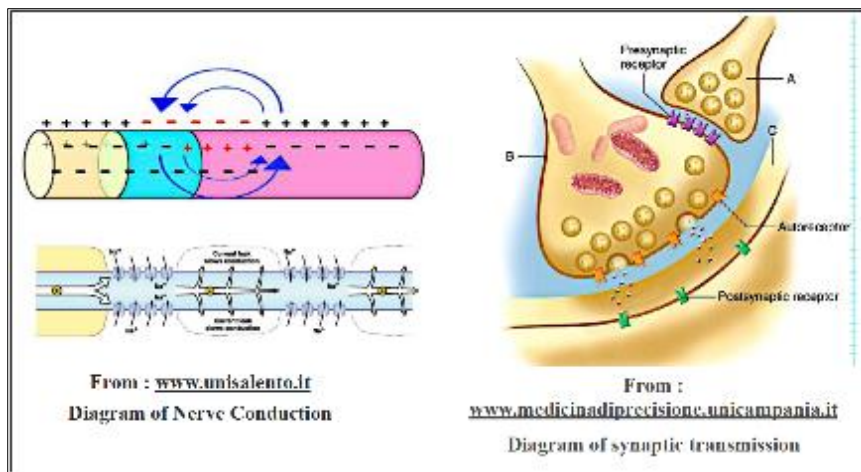


Figure 3 Diagram of Nerve conduction and Synaptic Transmission From www.unisalento.it

It has been shown that in the absence of these structures or through the use of substances that block their activity, there is no obvious manifestation referred to as neuronal function, of which consciousness is a complex manifestation, even if high-frequency magnetic fields are applied to neuronal circuits.

2.2.1. Concepts of consciousness on quantum bases

In the absence of a convincing definition and characterization of consciousness according to the vision of classical neurobiology, many authors have provided a modern interpretation introducing the quantities borrowed from quantum mechanics, such as the "quantum frequencies", and others, that would convincingly explain the origin of its activity.

This, on the other hand, has further complicated the knowledge of this mysterious entity, identifying it with the effect produced by causative quantities of a quantum nature even more abstract and evanescent.

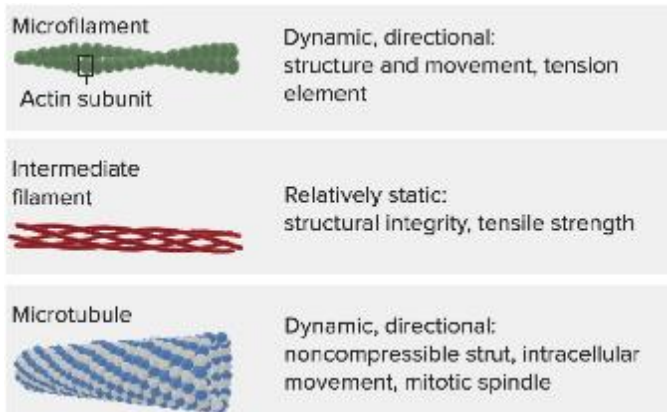
Let us summarize the terms of the question by examining the various hypotheses proposed on consciousness, each of which is based on more or less consolidated quantum bases:

Francis Crick formulated the idea of consciousness as an effect of tuning to the same frequency of neurons that constitute specific anatomical-functional areas of the human brain;

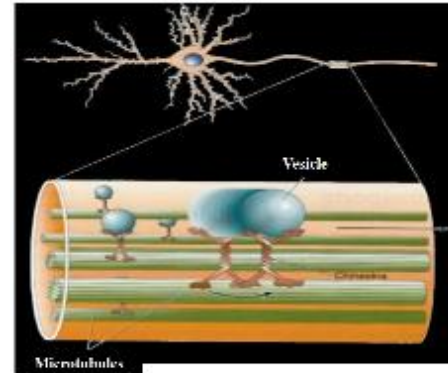
The Neural Correlates of Consciousness (NCC) can be defined as the minimal neuronal mechanisms jointly sufficient for any one specific conscious percept [16].

Penrose identified consciousness as a phenomenon emerging from the behavior of particular structures of the cytoskeleton of neurons;

With Hameroff suggests the idea that individual tubulin molecules in the microtubules of a neuron acts as a quantum-bit, or “qubit,” which are the elementary building blocks of quantum computing. Requiring the tubulin to be able to switch between alternative states in a coherent manner [17].



4A-By: Cytoskeleton ,The Lecturio Medical Concept Library



From : <https://www.neuroscience.net>
Axoplasmic transport of neurons

4B

Figure 4 Structure of the cytoskeleton 4A and microtubules inside the neuron 4B

According to this author, consciousness originates from the effective self-assembly of microtubules present in neurons Fig.4A. Microtubules, besides being the molecular target of anesthetics, would give rise, when stimulated with particular external frequencies, in the state of consciousness Fig.5[18-23].

Consequently, the state of consciousness does not depend on an internal mechanism, but is the result of stimuli external to the subject who experiences it.

Other authors support similar theses:

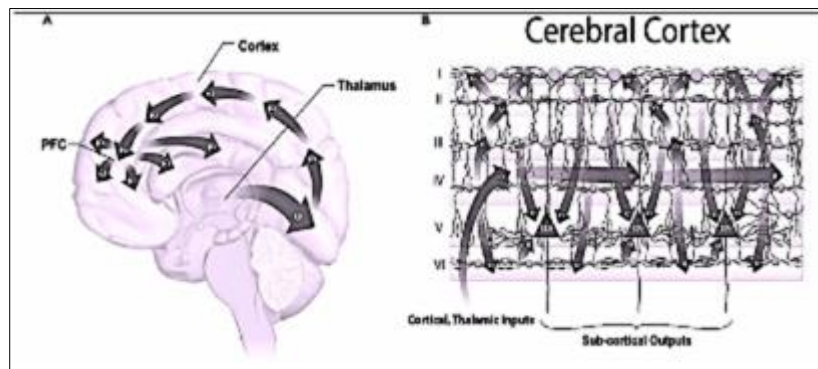


Figure 5 Hameroff S; Consciousness, Cognition and the Neuronal Cytoskeleton – A New Paradigm Needed in Neuroscience. *Frontiers in Molecular Neuroscience* June 2022 | Volume 15 | Article 869935

But the question that arises is, even assuming that the trigger stimulus originates from the frequencies emitted on microtubules or microtubules, from which neuronal circuits the stimuli start and to which others are then transmitted and decoded, and how they interact with the integrated and interconnected complex of the brain system, so that consciousness is manifested? It becomes impossible to isolate them and neglect the rest Fig.5.

2.3. Consciousness is under DNA control?

Several authors propose alternatively, that the guiding force of all cellular activities, consciousness and cognitive functions included, originates in DNA, conceived not only as a coordinating center of genetic replication and protein synthesis, but also as a center for the transmission of electromagnetic frequencies able to direct and coordinate all cellular activities.

I have closed the quotations extracted from the "garden of wonders" of scientific production on the matter, citing the incredible hypothesis of Rafi Letzter:

An Ancient Virus May Be Responsible for Human Consciousness, Live science February 02, 2018

The author argues in this article that consciousness would originate from an ancestral virus. It obviously ignores the elementary fact that viruses, as well as students of biology and medicine know, change continuously and with considerable frequency, how it is possible to detect the original virus is a mystery. With this article you reach the bottom of the most absurd hypotheses on the subject, and for this has been flooded with criticism and negative comments.

3. Discussion and comments

The first conception of consciousness which traditional neurophysiology proposes to us, despite not having provided a conclusive demonstration both on the connotation of the nuclei and neuronal circuits, from which it would originate, both of its properties, However, he bases his arguments on well-established experimental grounds.

With respect to the second quantum conception, entering into the merits of the question, the Authors cited above have defined consciousness as an activity resulting from the "quantum frequencies" produced by microtubules and/or on neuronal microtubules, which would act on the alleged specific brain areas designated for cognitive function.

There are many questions that feed these conceptions, we try to list them:

- The microtubules in question are molecular complexes of a protein nature in continuous activity and change regulated by protein synthesis Fig.4A, which is in turn epigenetically dependent on the functional needs of the brain as a whole, so that the consciousness under the domain of the inconstancy of microtubules would result in its unstable and uncertain functional variability;
- Who controls who. I have already mentioned the brain that is absolutely the organ with the most complex integrated communication system compared to any other, in all the higher animals, and it has a continuous activity of reciprocal interaction between the different brain areas Fig.2.
The distinction between sensory, exteroceptive and proprioceptive pathways, and motor pathways, has a purely anatomical-topographical value, and no functional meaning and such descriptive distinction is purely academic.
Also the evidence provided by neuroimaging with PET, to highlight the areas functionally activated with appropriate stimuli, as well as the experiences of electrical stimulation of specific brain areas, to reconstruct functionally interconnected anatomical associations, have little meaning because they cannot highlight and exclude all the anatomical-functional correlations existing with the single event examined.
Therefore it is difficult to determine with certainty in which part of the brain origins and where the quantum frequencies produced by microtubules are directed. There are numerous demonstration of this inextricable functional integration, for example in the visual system;
- Why under the effect of anticancer drugs, colchicine and substitutes, which block the activity of microtubules and mitotic spindle, the consciousness of patients being treated is active and functioning?
- If consciousness and its subordinate functions, pleasure, pain, hot, cold, etc. are dependent on the quantum frequencies of neurotubules, what is the meaning of the complex apparatus of sympathetic transmission, and the various neurotransmitters that regulate central and peripheral nerve activities Fig.4? And why with the millennial biological evolution the synaptic complex has been preserved in all eukaryotic organisms, in conjunction with the cytoskeleton apparatus?

Which of the two systems predominates in the maintenance of alertness and consciousness?

All these questions have not yet been fully answered.

3.1. Prokaryotes: An emblematic example

Unlike eukaryotic organisms, prokaryotes, Archea and Eubacteria have no cell nucleus.

Nevertheless, they manage to perform the same fundamental activities of the other more evolved living beings.

They feed, using metabolic pathways surprisingly similar to those of higher organisms to produce energy, while being devoid of mitochondria, multiply with an efficiency and speed that has no equal in the realm of the living, and above all they adapt perfectly to their environment.

They are able to avoid environments and substances harmful to their organism and are able to adopt the learned behaviors and transmit them to the descendant generations.

An emblematic example is antibiotic resistance.

Although a similar structure to eukaryotic cytoskeleton also exists and has been demonstrated in bacteria. [24] This has a role in morphogenetic definition. It also intervenes in reproductive multiplication, nothing more. In any case we cannot attribute to this structure the task of center of awareness and consciousness even in microbes.

It is interesting to note the fact that bacteria also have DNA, which according to other researchers would be the true responsible and regulatory center of consciousness. Which of the two postulates is true? Fig.6

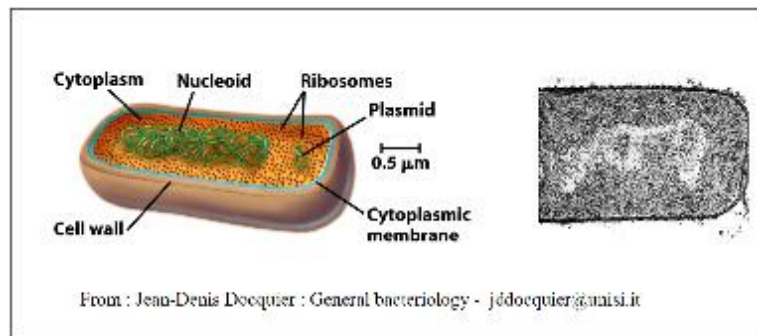


Figure 6 Schematic image and microphotography with the Electron Bacterium Microscope

From Jean-Denis Docquier: General Bacteriology

They are equipped with structures that allow movement, flagella and pili, and then they can move around choosing the environment that best suits their needs.

The ability to "feel", "recognize" and "select" the environment and nourishment best suited to them, is very reminiscent of the characteristics of the higher organisms that we call memory, consciousness, and even intelligence.

These organisms represent the most obvious contradiction to reductionist theories that identify higher functions like consciousness, the state of attention and vigilance, with the activity and quantum properties of microtubules and cytoskeleton.

The same reductive and partial vision can also be found in other researchers, which in the absence of convincing answers provided by classical and molecular biology on the complex functioning of multicellular systems, adopt the solutions proposed by quantum biology. Nothing more thunderous and phantasmagoric to fill the absence of explanations of the many, countless mechanisms and biological functions examined.

3.1.1. The third conception the DNA quantum regulatory center

This conception is in evident conflict with the second one, also supported by many other important Authors, according to which it is the DNA and the mechanism dependent on it, to direct and coordinate all cellular activities.

Such quantum conceptions have their only strength, and evidence, in the fact that they are based on very recent scientific theories and in some respects at the forefront, which make use of convincing confirmations as based on mathematical formulas [25-27].

So in addition to the quantum activity of the microtubules present in neurons, which govern everything in our cognitive sphere, today we also have a compelling interpretation of the electromagnetic activity of DNA, This clarifies the

coordinated and synergistic functioning of the complex cellular metabolism, which molecular biology cannot explain. Fig. 7.

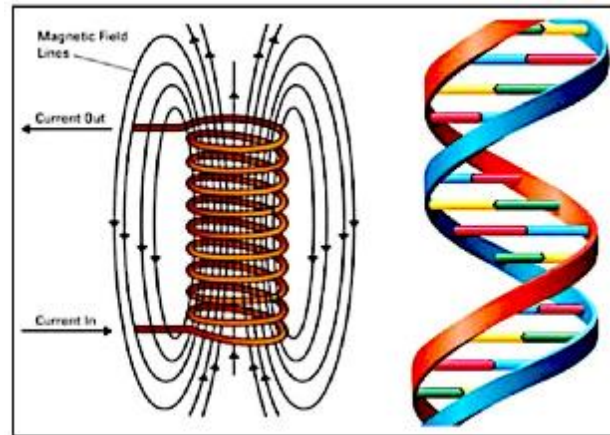


Figure 7 From: BIOLOGIA QUANTICA: BIOFOTONI E BIOFONONI Paolo Manzelli

<egocreanet2016@gmail.com> Analogy between DNA as antenna that generates electromagnetic field

Unfortunately, despite the high level of theoretical abstraction, and the daring conceptions of quantum-genetics, even these hypotheses have many inconsistencies, which I list below:

- How control IS exercised in organisms that do not contain DNA, for example in RNA viruses, in prions or in organisms that use RNA- reverse transcriptase, where RNA or prion dictate the rules?
- And what role does DNA play if post-transcriptional epigenetics determine the phenotype?
- DNA itself is subject to the effects of the fields in which it is immersed, gravitational electromagnetic fields, high frequency 5G waves increasingly present in the environment, so much so that there is a heated debate and widespread concern about the possible consequences that these energies could have on our health.
- But then who is the sole controller, the Deus ex machina, of all biological phenomena?
- Over the last thirty years, molecular biology has shown that the phenotype transmitted through DNA is far from being fixed at birth: the influences of the environment, which include nutrition, stress, emotions, exercise, the intake of natural substances or chemical mutagens, can modify it without changing the basic code. These changes, as evidenced by epigenetics, cannot be passed on to future generations, but they have a decisive impact on the living during their development, which escapes the direct control of DNA.
- Moreover, inside the single eukaryotic cells coexist two types of DNA, the nuclear one and the mitochondrial one of maternal origin, in equilibrium with each other. The red blood cells are free of nucleus and therefore of DNA and perfectly fulfill their physiological role for 120 days and then renew.
- And again, what happens during bacterial infection or parasitic invasion that introduces into the host a different type of DNA creating a conflict between two different DNA in the same subject, real "genetic chimeras". If we admit with quantum biology that DNA is the morphogenetic force to determine biological processes, which of these predominates and produces the final result?
- Another exception is homozygous twins: it is clear that they have the same genetic makeup, they are genetically identical, however it is impossible that they are epigenetically. Numerous investigations carried out on identical twins separated at birth and grown in different environmental situations, have shown that each gene is expressed in function of the environment in which it operates: epigenetic changes under different conditions will always give different results. Therefore, although the genetic background is identical, the genetic behaviour of identical twins could be very different.
- Another example is blood transfusions and organ or bone marrow transplants. Even in these cases we are faced with subjects carrying two different types of DNA. They are true genetic hybrids in which two different genomes coexist and on which genetic tests give dubious results that are difficult to interpret [24-25].

Summarizing we can schematically subdivide the conceptions of consciousness exposed in three large groups, neglecting the metaphysical approach, scientifically unfounded:

- The classical neurobiological conception
- The quantum electromagnetic concept
- The concept of quantum regulatory DNA

In the following table 1 are grouped the references of the three conceptions of the same type in separate columns to facilitate comparison and highlight the conflicting positions.

The list of articles, is not complete, but only indicative of the various divergent publications on the same subject.

Table 1 Subdivision of the conceptions of the conscience in groups of articles, antithetical and in conflict with each other

Classical Conception		Neurobiological	Conception quantistic	Electromagnetic	Quantum Conception	Regulatory DNA
Autor's	N° References	Autor's	References	Autor's	References	
Kandel et al	4	<i>Francis Crick and Christof Koch</i>	16	John K. Grandy	26	
Liqun Luo	5					
Andrea Nani et al	6	<i>Stuart Hameroff, Roger Penrose</i>	17	David Driscoll	27	
Mavi Sánchez Vives	7	<i>Felix Haas</i>	18			
Florian Mormann and Christof Koch	8			Alamanda Madhan Kumar et al	28	
Abdullah Abdulrhman Al Abdulgader	9	<i>Connie X. Wang et al</i>	19			
Jaan Aru et al	10	<i>Johnjoe McFadden</i>	20			
Lennart R. B. Spindler et al	11	<i>BAR-ILAN</i>	21			
Geraint Rees et al	12					
Pavel Ortinski et al	13	<i>Nir Lahav and Zachariah A. Neemeh</i>	22			
Aaron Schurger and Michael Graziano	14					
Simon Hviid Del Pin	15	<i>Hameroff S</i>	23			

The comparison of the literature highlights the contradictions existing within each theory and their mutual logical exclusion, which I have tried to highlight previously, and for this reason none of them taken individually is completely acceptable and convincing.

It remains only to re-evaluate the knowledge of classical neurobiological, based on the fundamental research of the previous two centuries, and integrate it with the recent acquisitions of molecular and quantum biology related to the mechanisms of sympathetic transmission and nerve conduction.

With the integration of the different approaches we are going to be able to explain the synchronically coordinated functioning of neuronal circuits, which neurobiology has not clarified, and it may be so useful to frame the network, it can be so useful to frame the central and peripheral nerve network within the electromagnetic field, which connects the whole system in a single functional complex.

The important thing is to set aside and overcome the individual theories that give a partial selective vision of consciousness and in this way distort the unitary and indivisible functioning that characterizes it.

4. Conclusion

4.1. Neuronal communication at the base of consciousness

The classical theory of communication analyzes various levels of interaction between living beings, from single cells, to cellular systems, to organisms, and conceives it as an electrochemical activity that connects various biological structures to each other. Depending on the structures involved, the interaction can take place through ions, molecules or molecular complexes.

Communication between cells takes place by means of chemical messages, in ionic form, of neurotransmitters, hormones, etc., or by direct contact through protein bridges tonophylbrill, desmosomas, etc. that bind cells functionally.

Also at the systemic level communication is produced using the same chemical messages that operate between cells.

These notions satisfactorily explain the sequential functioning between individual cellular processes or between organs. Another is to understand how synchronic and contemporary coordination takes place between all the cells of the organism as a whole, necessary to maintain the functional homeostasis of the living.

Likewise, the complex functioning of consciousness is inexplicable within this conception.

With the advent of modern physics and the introduction of quantum mechanics, a new interpretation of biological phenomena has gained ground, with the adoption of the quantum laws applied to biology.

The new paradigm offers an organic and unitary vision of the functioning of biological systems, and of the essence of matter from the atomic level to the cosmic level with the use of the same fundamental laws.

The new sizes introduced by the mechanical quantum are the concept of the field, in its various declinations, the electromagnetism that embraces multiple manifestations of wave nature, and others of more difficult meaning.

The new vision in the biological field has given rise to a new branch of biology, quantum biology.

According to this discipline, all biological manifestations, in analogy to what is hypothesized for the other material substances from quantum mechanics, are under the domain of electromagnetic fields of various frequencies, which direct and coordinate every aspect of their activities, if and when their respective electromagnetic waves enter phase and frequency resonance.

Thanks to these new theories, we are reconstructing and reinterpreting many phenomena of a physical and biological nature with an approach that demonstrates greater possibilities for a unified and global solution.

As for biological phenomena, while on the one hand with the electromagnetic field theory it is possible to enclose all the vital manifestations in a coordinated and synchronous functional unicum, on the other hand it is difficult to explain how the same electromagnetic field can affect membrane phenomena and electrochemical gradients that depend on a dynamic ion exchange process. The problem is how to recompose the different visions in a single coherent conceptual body.

Cellular contacts and interactions happen, as we have mentioned through direct and indirect communication between cell membranes, then these too must be under the control of the electromagnetic field that surrounds all organisms.

Unifying the theory of consciousness by reconciling the neurobiological with the quantum conception is an extremely complex undertaking, but we must nevertheless pursue it to understand our very essence and our human mission in the mystery of the cosmic universe.

Compliance with ethical standards

Disclosure of conflict of interest

Bruno Riccardi has any conflicts of interests related to this manuscript.

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