

## DeepNeuroscience: The Way the Brain needs to be Looked into

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### Abstract

Neuroscience is not a stand-alone discipline. The brain interacts with outside environment at different depths of nature. Neuroscience is embedded in cognitive science, which in turn is embedded in cosmology and astrophysics. Science of various information-states is the key to go about their operation. Five different areas have been specified with innovative ideas and review of presently available knowledge in the literature namely, cognition, behavior, dark energy, consciousness and layers between signal and consciousness. On the basis of these ideas several research questions and research statements have been made. What is in demand is innovative technology in addition to existing neuroimaging techniques and computational neuroscience; for example, new clinical skill for cognitive analysis, brain inter-netting, a kind of mechanization mimicking 'psyche' that runs by not force, energy or field, but by means of 'will' and intention, a technology that could harness dark energy as visible energy and another new technology that could help healing. All said and done, this is the time to change the way we look into the brain and penetrate into the depth of neuroscience to analyze the brain, cognition and behavior in the context of the multiversal whole.

**Keywords:** Neuroscience, Brain, Dark energy, Neural Signaling, Consciousness

### Introduction

In traditional teaching of neuroanatomy, the brain vertically is a Triune organ consisting of brainstem, limbic brain and cortical brain [1]. Rostral to the brainstem, the brain is horizontally disposed as the 'left' brain and the 'right' brain at the diencephalon and telencephalon level interconnected by commissural systems, the largest one is the corpus callosum. In this teaching we miss the point that the brain is locally vocal to transmit and express the global! Or, the Global chooses the brain to become local and vocal! The systems neuroscience is nested within the systems psyche, the systems psyche is nested within the systems cosmos and the systems cosmos is nested within systems consciousness. About  $10^{11}$  stars make a galaxy and  $10^{11}$  galaxies make the universe. Neurobiology says, the human brain consists of hundred billion ( $10^{11}$ ) neurons in addition to two to ten times of that number of glial cells (astrocytes, oligodendrocytes and microglia). In neurobiology we often miss the structure, organization and the purpose of a forest in name of individual tree when we put electrode inside single neuron. We miss the community for the sake of the individual when we generalize the findings of single ion-channel investigation. Neurons fire! Myelin produced by oligodendrocytes insulates the individual firing wires of axons and dendrites, and makes the speed of spread of fire much faster. Astrocytes offer supports to neurons with metabolic shuttles, and manufacture ATPs for the neurons. Microglial cells work as part of the immune system of the body. We miss the point that astrocytes make the

synapse tripartite and serve a much complex role in cognitive activity especially in quality control of thinking not only in the cerebral cortex but also from the cerebellum [2]. The most cited schism between the brain and the body is the immune system where we miss the point that the brain is not as immune-privileged as traditionally thought! Neurons and T cell directly interact [3]. Besides lymphatics in pia matter, astrocyte foot processes absorb immunomodulators from the blood that directly go for neuronal sensing. Brain's immune modulators have significant role on the general immune system of the body systems [4]. In neurophysiology we miss the point that signaling pattern is not the all for making us conscious. The terrain of consciousness is far deep than what is superficially observable as signal fluctuations. Functionally, we divide the brain as cognitive brain, affective brain and psychomotor brain. The point that is missed is that cognition is not the function of the brain but the function of an orchestrated constellation of cognitive faculty. Cognition is abundant in brainless animals (for example sea-urchin), in plants, in a single cell or even in acellular slime mould [5,6]. We consider the brain as the affective organ for anxiety, emotion, anger and depression but miss the point that the brain is also the organ for bringing order out of emotional chaos. It avoids the unpleasant and churns out the treasure of experience, builds up trust, faith, devotion and love. We never ponder on the real purpose of evolution of the brain as an organ, which is to unify consciousness within and consciousness without the body systems. We investigate development of physical skill, language and communication skill by the brain but we miss the

point that the brain is engaged in developing the psychomotor skill for obtaining freedom from the 'local' to transmit and express the nonlocal which is global, universal and multiversal. DeepNeuroscience is to collect supportive evidence for investigation of the truth within these ideas and statements.

In DeepNeuroscience, we need to go beyond computational neuroscience, mathematical modelling, stimulation and neuroimaging techniques to develop new technology to investigate the relationship of the brain with the deeper recess of nature. Nature does not end with the Einstein's constant (velocity of light) that excludes simultaneity of events, Planck's constant that excludes continuity of events and entropy barrier that excludes identity of events. There are plenty of events which are simultaneous (for example, multicentric origin of human evolution started simultaneously in several geographical places). We are to seal the discontinuity between events by collecting evidence in our explanatory gaps. There are many events which are identical in small and large scale (for example, life and death in Schrodinger's cat, sleep and wakefulness of Buddha, universe and a tortoise, identity of wisdom and signal in Multiverse type IV [7]). All such phenomena could be accommodated through neuroscience once we start examining the nested hierarchy in nature. Besides classical (nest I) and quantum nest (nest II), there are sub-quantum (nest III, the vacuum) and sub-subquantum nests (nest IV, the sub-vacuum) of nature, which, in turn are nested within consciousness (nest V). Within this nested hierarchy of nature-consciousness, the brain and its deep science are embedded!

Murray Gell-Mann, Nobel-winner (1994) in Physics has said, "we need to overcome the idea, so prevalent in both academic and bureaucratic circles, that the only work worth taking seriously is highly detailed research in a speciality. We need to celebrate the equally vital contribution of those who dare to take what I call "a crude look at the whole". Despite the scale difference of twenty seven orders of magnitude, does the human brain resemble our universe in number and complexity of constituents, structure of their network, overall organization and in the dynamics of operation? Probably yes! The science has started moving in this direction, with "the quantitative comparison between the neural network and cosmic web" [8]. At the stage of such beginning for developing neuroscience in the context of the whole, this paper will touch upon five important areas namely, Cognition, Behavior, Dark energy, Layers between neuronal signal and consciousness, and finally Consciousness itself.

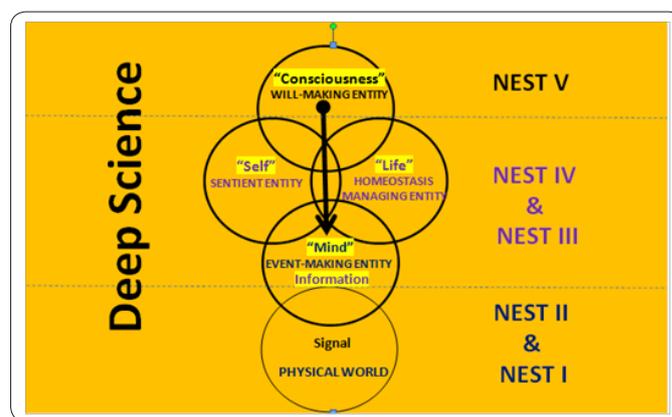
## Cognition and the Brain

Cognition is a function of cognitive faculties which constitute the cognitive organ. Cognition happens across the entire spectrum of living entities. The cosmos, the human being and a single cell are connected in the web of cognition [9]. Computer simulation has mapped the apparently non-observable (dark) cosmic matter web that connects the galaxies and the findings surprise everyone that there is a remarkable similarity with the lacy design produced by brainless multiheaded slime mould [10]. Now the physicists are looking for cognitive ability in non-living entities too. Questions are being asked whether photon and

neutrino, conformon and phonon are conscious? As humorously told, "Physicists are made of atoms. A physicist is an attempt by an atom to understand itself" (Michio Kaku in *Parallel Worlds: A Journey through Creation, Higher Dimensions, and the Future of the Cosmos*). Cell biologists have identified sensor molecules on the cell membrane [11] and within the cell [12].

What are the cognitive faculties and what do they cognize for? Mind is a cognitive faculty that cognizes signal and information. Self as a cognitive faculty cognizes phenomenon and the invariance present in the phenomenon. Life is a cognitive faculty that cognizes uncertainty in the dynamics, asymmetry in the structure and the dark energy in the list of its propelling fuels. Consciousness as a cognitive faculty cognizes the overall attitude of the subject that emanates as the personified summation of conscience and values, ethics and aesthetics in the being. Cognitive faculties thus together constitute systems, which the author has called the systems psyche [13] that stretches across the entire spectrum of nature-consciousness. Operation of system psyche is run not by conventional force, energy or fields but by means of 'will' and intention. There is no Governance in the systems psyche when consciousness becomes non-functional, when there is no generation of will or intention! The mind is the final common pathway for the systems psyche to communicate with the material world and vice versa.

In the nested hierarchy of nature-consciousness, mind and information operate from the nest III. The faculty of self and life operate from nest IV of nature. Consciousness, although everywhere asserts from nest V (Figure 1).



Orbits of potent autonomous operators in Phase

**Figure 1:** The cognitive organ (systems psyche) consists of an event-making entity, "mind", a sentient entity, "self", a homeostasis-managing entity, "life", and a will-making entity, consciousness, along with information. Signal operates in physical/material world (nests I & II). Information and mind operate from nest III while the faculty of self and life operate from nest IV of nature. Consciousness operates from nest V. Consciousness has a direct one-way connection with mind, which works as the final common pathway to the physical world. From the physical world to the cognitive word, mind is the gate. Operational loops of the cognitive faculty intercept and interact. DeepScience extends across the entire spectrum of nature.

DeepNeuroscience is to investigate how does the nonlocal faculty of cognitive apparatus, the constellation of apparently looking phantoms, get confined to the 'local' brain to work with, and deliver their decision in the behavior! Author suggests that the cognitive organ operates as interphase between brain-independent consciousness and brain-bound consciousness [14]. At the cellular level, DeepNeuroscience is to investigate the role of neuron-glia mosaic in cognition. There is no need of astrocyte to form tripartite synapse where there is no play of information. We do not see any astrocyte in the synapses between two or more neurons in peripheral ganglia and also in several central nuclei where only signals are transmitted.

## Brain and the Behavior

As said, the brain is not the organ of cognition. The brain is the organ to express in behavior what follows cognition. This top-down idea is consistent with the transmission theory of brain function by William James, Aristotle's saying, "Mind is attached to the brain", the radio reception theory of consciousness of Henri Bergson, the brain acting as a biological reducing valve proposed by Aldous Huxley and television analogy of brain function by George Wald.

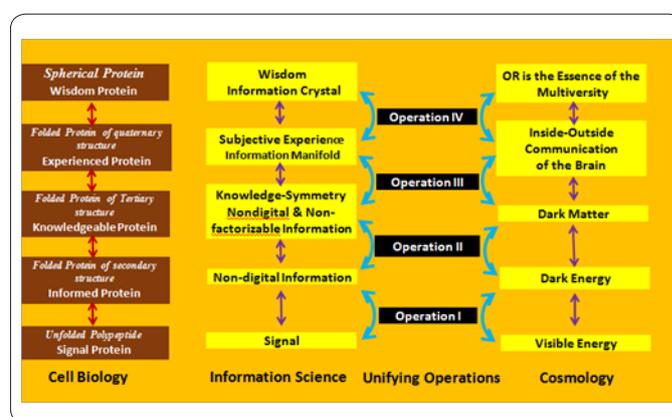
Acts of cognitive organ including consciousness happen in non-observable plane. Behavior is visible in observable domain. Subjective consciousness and cognition are within the nature of the being. Behavior is what is expressed as the character. Within and without, nature and character fall therefore within the ambit of consciousness cognition and behavior. Neuroscience, therefore, for its completion at the expressive end needs behaviour [15].

Several behaviors of the human being are automated since those have achieved a reasonable degree of perfection. In fact, the overall personality of the being is the result of automated circuitry through the striatal extrapyramidal system. Cognitive behaviors are mostly left non-automated, although synaptic potentiation makes the behavior to fall in expected line. In decision-making behavior, consciousness, mind, self and life concur with each other in quality management of information within the systems brain. Serotonin and dopamine are linked to decision making process [16]. Communication skill and language are examples of learned behavior. Leadership behavior emerges through the head-brain, heart-brain and the gut-brain! Inverted leadership is possible with ontological reversal of brain-consciousness relationship, when Power is with consciousness and not with the brain. Neuroeconomics is an emerging branch of neuroscience, a combination of neuroscience, cognitive science and economics, which explores the role of cognitive processes behind economic decisions and the hormone oxytocin has a definite role in it [17].

There is a suggestion that the brain might be considered as the "sensor" of behavior of the subjects or objects around. Further, Human brain is not a "stand-alone" information processor! Our brains are interconnected at different depths of nature! Inter-netting of several brains has been experimentally demonstrated [18-21].

## Dark Energy and the Brain

Seventy percent of our universe is constituted by dark energy. Dark energy causes expansion of the universe in contrast to dark matter which causes contraction. Dark energy is another sibling of space and time and according to author all three originate from splitting of information. The pathway of rescue from dark energy is "life". What is the relation between the brain and the dark energy? Dark energy-visible energy interconversion happens inside the brain because the brain is in hand and glove with the cognitive apparatus and is rich in live cells. The act of cognition uses various information states [22], interconversion of which requires dark energy as currency. The fall-outs of the cascading of such cognitive processes are reflected in concomitant change of conformity of protein structures within the neurons and the glia, which is again dependent on the visible energy-dark energy interconversion (Figure 2).

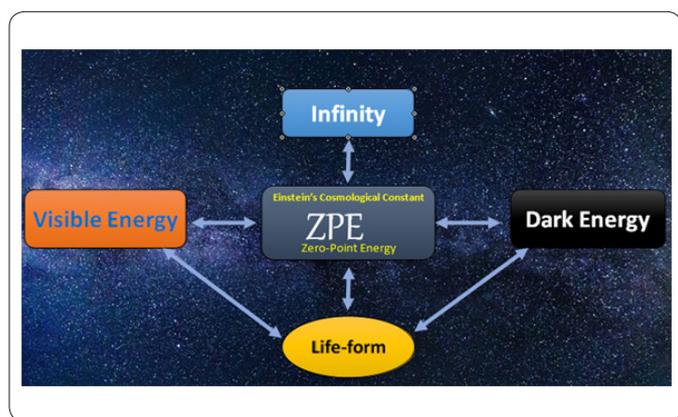


**Figure 2:** Cell biology, Information science and Cosmology are intertwined by four operations. From signal to wisdom, the information states have been shown by the left-sided yellow boxes piled one upon the other. Interconversion of these states are executed by four bi-directional operations, operations I, II, III and IV. There is conversion of visible energy into dark energy during the ascent over the ladder as shown in the yellow boxes on the extreme right. Inside-outside communication happens during generation of subjective experience, executed by operation III. Objective Reality (OR) is the Essence from which several universe are generated and in which several would annihilate. On the extreme left, shown are different protein structures, primary, secondary, tertiary, quaternary and spherical, conformational changes of which utilize dark energy.

While the brain constitutes only 2% of body mass, it consumes more than 10% of cardiac output and utilizes 20% of the energy consumed by the whole organism [23]. ATP has been recognized as a ubiquitous gliotransmitter integrating neuron-glia mosaic networks [24]. Astrocyte is the only cell in the body so far recognized which in healthy condition releases its "cash" energy, ATP in substantial amount for the utility of another cell such as neuron. Visible energy is converted into invisible dark energy when signal becomes information, information becomes knowledge, knowledge becomes experience and experience becomes wisdom. The reversal of dark energy to visible energy happens when wisdom breaks into experience, experience into knowledge, knowledge

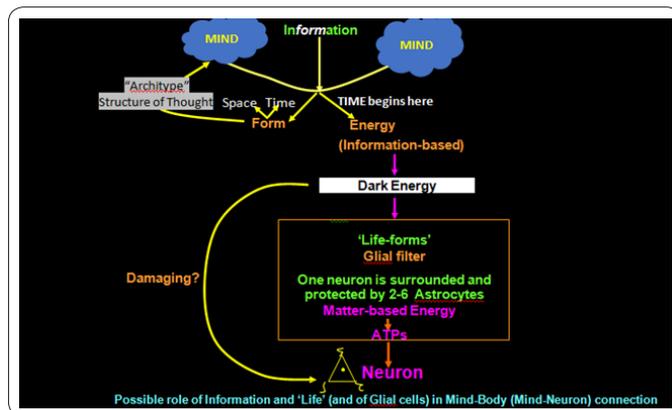
into pieces of information and information breaks into signal for senses. Without the presence of operation of mind, there are only noise and signals, and no information! Without the presence of operation of faculty of self, there is no formatting of information into knowledge and so no knowledge architecture is available. Without the operation of faculty of life, there could be no generation of experience. Without operation of consciousness there is no possibility of sublimation of experiential knowledge into wisdom! Biochemical structural representation of this ladder extends from unfolded protein to spherical protein (e.g., histone around which DNA molecules coils inside the nucleus).

Interconversion of visible energy and dark energy is made possible at the zero-point energy (ZPE) state of the brain where and when the living cell gets an opening into the Infinity (Figure 3). Molecular configuration of intracellular proteins could change concomitantly since the molecules too are in communication with the infinity in the presence of “life”. Therefore, the brain at zero-point-energy state becomes relevant [25] for deep examination.



**Figure 3:** Visible energy-dark energy transformation occurs through zero-point energy (ZPE) in the presence of life-form. Neither life-form nor ZPE is by-passable in this interconversion. Life-form is engaged in homeostasis of visible energy-dark energy through zero-point energy. Life-form remains connected with the Infinity through ZPE.

Probably, dark energy is directly harmful to neurons. Therefore, one neuron is surrounded by several astrocytes which participate in conversion of dark energy into visible energy. The source of dark energy is the information-split phenomenon. It is delivered when the “form” inside information is delivered by the act of mind, which has conceived the information. The form delivered might go back to mind to be processed as thought-structure/“archetype”, or breaks into space and time (Figure 4).



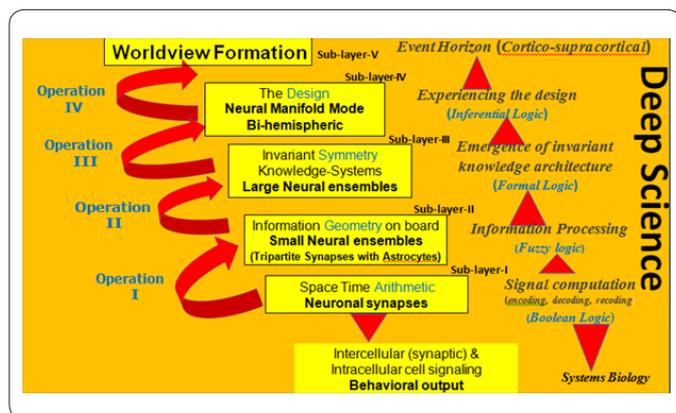
**Figure 4:** Possible roles of Information and “Life” (and of astrocytes at cellular level) in Mind-Body (Mind-Neuron) connection are shown in the figure. Information is conceived by the mind. Mind delivers three children; space, time and energy. TIME begins with this delivery. Space and time might again unite to form the structure of thought (archetype) and goes back to mind. The energy delivered is information-based energy, dark energy. The neurons are protected from direct influence of this dark energy by glial filter. Astrocytes surrounding the neuron convert dark energy into matter-based energy. Abundant numbers of ATPs produced by astrocytes are transferred to neurons.

### Neutrino and the Brain

Many scientists consider enigmatic neutrinos, the chargeless and most likely massless particles [26] are nothing but part of dark energy. Brain-vacuum interaction and neutrino-brain interaction alter brain-consciousness, cognition and behavior in the systems. Several research questions and research hypotheses have been made by the author on this issue [27]. Both vacuum and neutrinos are relevant in regeneration and healing of the brain. The author firmly believes that the science of healing would be profoundly improved as we learn how to use the neutrino beam in the wounded region making non-amenable neutrinos more amenable by our innovative technology.

### Layers between Neural Signaling and Consciousness

Neuroscience at the present stage investigates signal patterns in the neural network as the source of consciousness. We investigate it through mathematical modeling, computer simulation and with the help of neuroimaging techniques. True, at the outset, the signals and not the noise are the first objective entities to work with. However, with the application of the logics of deep science for the pathway from the observable to non-observable consciousness it is possible to construct the layers in between [28]. At the neuronal level, the cascading steps recruits synapses, small group and large group of neurons, connectomes, and neural manifolds which interact with the “global” at the event-horizon, at the boundary of the brain in the supracortical domain! There are four operations in the cascade as shown in figure 5.



**Figure 5:** DeepScience of five sub-layers extending between signal computations to event-horizon have been depicted in the figure. Four operations effecting the cascade in bottom up direction are shown on the left side. Corresponding neural recruitments are shown in the central yellow boxes. Different logics playing their respective roles and emergence or structuration are shown on the right side.

## Consciousness and the Brain

Consciousness is relevant in cognition, cosmology and neuroscience. In cosmology, consciousness as Objective Reality (OR) is the Essence of the Multiversity, the essence from which several universe(s) are bubbled out and several universes will annihilate. The multiverse and supracortical consciousness are leading theory in cosmology and neuroscience [29]. Consciousness is non-observable, also nonlocal and scale-invariant. But it is irreducible, ineliminable and inviolable. There is no evidence that the brain is the Source of consciousness. On the other hand, autoscopic phenomenon like out-of-body experience, flying out of body during sleep, near-death experiences, communication of several brains by means of inter-netting are supportive of the view that consciousness uses the brain as its local 'home' and for its manifestations. This idea causes ontological reversal where the Power is not with the brain but with the Consciousness. The brain operates as an inverted tree with roots up open supracortically while the peripheral nerves work as branches down ramifying within the body (Bhagavad Gita, chapter 15, shloka no1). The causes of consciousness-philial of neurons and neuron-philial of consciousness merit depth investigation.

Consciousness is not inert but operational and this operational consciousness is relevant in science. Operation of consciousness couples with operations of other cognitive faculty when it uses cognitive currency of several information-states. Lower down the cascade, consciousness remains connected through information-signal transformation with the operational mechanics within the material nature, namely quantum mechanics and classical mechanics.

During consciousness-brain interaction at the time of life-changing experience there is inside-out and outside-in phenomena involving the boundary of the brain. The phenomenon is as if the being is shifting from the border of the universe to the domain of multiple universe(s), the multiverse! Several great discoveries have supposed to happen at the

boundary of the neuroscience and cosmology during such inside-out and outside-in phenomena (for example, the idea of constructing a computer from the operations of mind, discovery of GPS technology from similarly acting neurons inside the brain, construction of AI in the pattern of human intelligence etc.). This is as if the systems multiverse and systems neuroscience are both operating within the systems consciousness.

## Innovative Technology

Any science to grow requires supportive technology. For deep science nothing can be truer than this. At this stage it is possible to pen down five areas.

Accepting the idea that the brain is nested within the cosmos, it is possible to innovate the clinical skill of analyzing the brain and cognitive facet of the subject especially in disease conditions such as in Disorder of Mood; Depression, Melancholia, Hypochondriac state etc., Disorder of Thought: Schizophrenia etc., Motor Disorders: Epilepsy and Catatonia etc., Psychedelic states: Altered states of consciousness etc. etc. We are waiting for technology when the focused beam of neutrinos at different concentration could be used for healing of such ailments.

Since cognitive faculties operate by means of intention and 'will' and not with force, field or energy, innovation of a mechanized device that run by intention and 'will' would clear many aspects of this complex issue.

Technology of harnessing dark energy could open up unforeseen change in energy economics, and make understanding of neurobiology better and would also help in developing the science of information states.

Developing live cytoscan technique to visualize protein folding and unfolding with manipulation of dark energy would be very promising for the ideas developed on metabolic effect of dark energy in this paper.

The technique of inter-netting of several brains through different depths of nature is supposed to clear the understanding of currency of mechanics at different nests of nature and help us to develop better AI.

## Perspectives

With the innovative ideas and prospective technology, we have laid down the roadmap for Neuroscience for more than a century. Human brains will understand why our brains are here and how all they do function! This has a far reaching impact in social science and culture too. Freed from religions and politics, the humanity would understand Spirit better.

## Conclusion

G. K. Chesterson touched the right cord when he said, "The poet only asks to get his head into the heavens. It is the logician who seeks to get the heavens into his head. And it is his head that splits". The outcome of cognitive science of such phenomenon is "information-split" resulting in the creation of new organization with new space and new time, giving birth to a new Worldview accommodating science, humanity and spirit, like the one created in this paper. Irrespective of whatever way we might look at the brain, the multiverse is looking forward to the human brain ensuring the survival of our universe!

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