



Systems-bound and Systems-independent Consciousness Complex Inter-phase in between: From Narrative to Science

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Abstract

Consciousness is at the core of behavior of live-systems. Since consciousness is described to be both inside and outside systems, a model of the inter-phase required for communication between systems-bound consciousness and systems-independent consciousness has been created identifying its constituents, their operations and interactive processes. The paper also shows the way by which mind, 'life', self and consciousness could be brought within the umbrella of systems science. The time frame for transformation of the narrative to science has also been discussed.

Keywords: Hard problem; Systems-bound and Systems-independent consciousness; Inter-phase

Abbreviations: CEO: Chief Executive Officer; BOB: Bucket of Bugs; IIT: Integrated Information Theory; OR: Orchestrated Reduction

Introduction

Consciousness is at the core of behavior and psychology. However, the idea and concept of consciousness is so variable across the cultures that it is difficult to bring consciousness within the purview of science. For the East, consciousness is homogenous, universal and present both within and outside the systems. In the context of systems-independent consciousness, there is use of terms like cosmic consciousness, nature-consciousness, universal consciousness, trans-universal consciousness, non-dual consciousness etc. For the western science, consciousness is heterogeneous, granular and confined to the live-systems like biological cell (c.f., cellular cognition) and all multicellular organisms including us. Consciousness not confined to any systems is difficult to study in science. Two systems, which can be studied in the context of consciousness, are biological cell and systems brain. Systems biology is said to consist of metabolome, proteome, genome and epigenome. In the live systems, biochemistry, biophysics and bioinformatics have been brought within the ambit of systems science but not the psychology and consciousness. One of the objectives of this paper is to bring consciousness and psychology within the purview of systems science in systematic connection with systems bioinformatics. Having accepted both eastern and western

view on consciousness it becomes imperative to describe the inter-phase, which is juxtaposed between systems-bound and systems-independent consciousness. This is second objective of this conceptual theoretical paper. In this paper we are on the way to construct a model, which would accomplish both the stated objectives.

Consciousness bound to the Systems

Even the behavioral response of any unicellular systems reflects closely the response of consciousness. Cell's response is ideology-neutral, solution-centric and holistic. It has intelligence, it works on options and involving all sub cellular parts in the decision-making process in a holistic manner chooses the best. The aim of response is to find out a solution for the problem it is in. The behavior from a brain-confined consciousness is more complex. In the context of the human being, consciousness has been "concentrated" within and around the organ brain. The brain is not merely a form of matter! It is a live-matter! The brain consists of hundred billion neurons and almost similar number of glial cells. Neurons and glial cells individually are conscious live systems and therefore, constitute the subsystems of the brain. The brain is more like a bucket of bugs (BOB) than a signal circuitry of a computer.

According to the most revered eastern spiritual text (Upanishad), however, the primal essence (read consciousness), which drives 10^{11} neurons and almost similar number of glial cells within the brain, is also the driver of 10^{11} stars in a galaxy and 10^{11} galaxies of the universe. Consciousness within the systems operates from three positions; as systems-bound ground consciousness, as 'self', the chief executive officer (CEO) for the systems, and as consciousness distributed over its sub-systems as informational molecules at the level of the classical physics, or as "be-able" sub-atomic quantum particles at the level of the quantum physics. Quantum potential, said to be an information reservoir [1], which is everywhere, undiminished with distance and guides particles what trajectory to follow might also be representative of distributed consciousness at microscopic physical level both within and outside the confined systems. Consciousness as ground should not be considered merely a metaphor since such a start will make the science of/for consciousness a pseudoscience. Consciousness acts as the ground without any background. It is not an inert ground but a participating ground. On its foreground there are operators and operations. Some are non-observable; others are observable at the macroscopic physical sensory plane.

Different descriptions of systems-bound consciousness of the brain

In the context of systems-bound consciousness of the brain we describe it as contents of consciousness, states of consciousness, levels of consciousness, developmental lines of consciousness and planes of consciousness [2]. Examples of contents of consciousness are memory, thoughts etc., which bring granularity in consciousness. There are three basic states of consciousness such as wakefulness, dream sleep and dreamless sleep, which every animal go through. There are various pathological states of the consciousness such as coma, vegetative state, minimally conscious state etc. There are psychedelically altered states of consciousness induced by LSD and marijuana etc. The levels of being-consciousness could be described as brainstem being, limbic being and cortical being etc. Three developmental lines of consciousness follow cognitive, psychomotor and affective aspects of consciousness. Besides, there are various planes of consciousness; subconscious, conscious and super-conscious, which could be 'higher' or spiritual.

Inside the brain there is specific segregation of neurons as various nuclei are disposed vertically and horizontally. P. D. MacLean [3] described the triune character of the brain where consciousness has behaviorally surfaced in the reptilian brain as brain stem consciousness, in paleo-mammalian brain as limbic system consciousness and in neo-mammalian brain as cortical consciousness. We can ask what is next in evolution after cortical consciousness?

The Inter-phasing systems

Consciousness within the systems like unicellular organism or within a brain is separated from and connected with systems-

independent consciousness by an interface, which is layered. The two communicate through a complex inter-phasing system, which is sandwiched in between. The phase-transition from systems-independent consciousness to systems-confined consciousness and vice-versa occur through this inter-phasing system.

The interface between brain-bound consciousness and the systems-independent consciousness has been named "supracortical consciousness [4]. This was done on the basis of three enduring queries by the author. When almost all of the dendrites of cerebral cortex gather information from infracortical location of neuraxis why the apical dendrites of the pyramidal neurons in the cerebral cortex are seen to go upwards? The dendrites look up to receive what? What are the functions of numerous non-synaptic spines on such apical dendrites? What is the function of dendritic matting at the top of the cerebral cortex? Does it serve as antennae for the brain to receive information/signal from the supracortical domain? The question how the brain-confined consciousness and the brain-independent consciousness execute their phase transition in either way leads us for investigating this inter-phasing system, which works beyond the measurable realm of physical science.

On construction of this Inter-phase

There are efforts in science to construct this inter-phase but it is being done excluding mind and life. Most of the recently developed theories on consciousness take direct vertical leap from matter to information and next from information to consciousness. as if nothing exists in between information and consciousness Tononi's Integrated Information Theory (IIT) [5], Tegmark's perceptronium, where consciousness is a state of matter and Chalmer's non-reductive information in hard problem [6] do not consider any operation of mind, or 'life' in the intervening terrain, although Tegmark invokes 'self'-like properties in his conceptual leap from computronium to Perceptronium. Perceptronium has distinct information processing abilities. Penrose and Hameroff's Orchestrated Reduction (OR) reduces consciousness directly into space and time, into space-time geometry, into frequency of vibration of micro tubular proteins [7]. Space per unit Time, i.e., frequency or vibration is observable in the sensory domain. The theory thus misses the terrain between sensation and consciousness. Thus, the effort of inter-phasing in all such theories remains incomplete, often lop-sided and without any path-breaking prediction!

The inter-phasing system, as proposed in this paper, is not 'simple'. It is not made up of any known energy, force, fields or signals. It appears complex because of several operators and operations within it, which are not observable, not visible in MRI or PET scan, although realizable by experience. We need equipments such as mind-scanner, 'life'-scanner and 'Self'-scanner for any such recording!

The Narrative

In this paper, at this stage we would make a narrative by a series of coherent statements (i) on the irreducible constituents of the inter-phase; (ii) on specific characteristics of the operation as required for their identification and understanding; (iii) on the sensitivity of various operations. Having done this we would construct a model of this inter-phasing system. Finally, we would make focused research hypotheses on the representatives of these operations at the molecular level of a cell or at the neurotransmitter level of the brain.

(i) Constituents

Two constituents of this interface are easy to identify. One is consciousness itself and the other is information. The organ of communication between two conscious systems is mind, the third constituent of the inter-phase. Inter-phasing has been happening within live-systems. Therefore, somehow, somewhere sometime during inter-phasing process, 'life' would come into the scenario. It is natural that the CEO of the system, the self, would be seriously involved in this inter-phasing process. Information, mind, life, self and consciousness are therefore five irreducible constituents of these inter-phase systems. There is organization by mind, organization by self, organization by 'life' and organization by consciousness in the inter-phasing systems [8].

(ii) Description of the Operations

It is difficult to identify all operators as ontological entity. However, it is easier to characterize the specifics of operation(s). Operation of mind could be specified by conversion of signal into information and information into signal. There are three interrelated properties, which characterize operation of 'life'. Systems, which can manage uncertainty, can harness dark energy and has the ability for holistic symmetry sensing has been using the operations of 'life'. Uncertainty management by life-systems indicates its access to new information. Access to mechanism of harnessing dark energy explains life's uncoupled action, spontaneity in apparent absence of any known laws, negentropy and the ability to transform information into knowledge. Holistic symmetry sensing for the whole systems is a unique property of 'life' required for its very survival, development and fulfillment within its porous boundary and available plasticity of logistic. Self's operation is identified by its offer to mind the program for information processing and information formatting, and by the operation that analyzes and judges the performance of the subsystems, logic modules and the sensors. Operation of consciousness is recognized by cognition, emotion (feelings) and 'will'. To will is the prerogative of consciousness and of no one or nothing else. In the physical plane, Einstein's constant excludes the possibility of simultaneity of events, Planck's constant excludes the possibility of continuity of events and entropy barrier excludes the possibility of identity of events. The outcome of consciousness's operation is observed in the behavioral domain as *simultaneity*, *continuity* and *identity* of

several events.

Operations could also be understood when the operators become conspicuous by their absence. Where there is no mind, there is no thought. In absence of self there is no experience for the systems. No 'life' means a totally ineffective consciousness for expression in the sensory domain! Without presence of a functioning consciousness there is neither wisdom nor will!

(iii) Sensitivity of the Operations

The sensitivity of each of these operations is different but definite. Mind is sensitive to information. Self is sensitive to phenomenon. 'Life' is sensitive to alteration of holistic symmetry of the systems. Consciousness is sensitive to, and responds only when other constituent admits its inability to act or perform, surrender its properties to consciousness and waits actively for the final call from consciousness. When consciousness fails to generate new ideas and infuse motivation to the surrendered operator for the systems to continue, the system is no longer sustainable.

The Model

On the canvas of the ground consciousness, operations of mind, life and self run autonomously. They constitute the fabrics on the canvas. What we see as signaling network is embroidery over this fabrics. None of these operations could be reduced or outsourced from the systems.

The operations have been offered autonomy since they have achieved the desirable level of perfection and are in harmony with, and never at cross with the 'concern', 'intention' and perfection of the systems. Although autonomous, there is hierarchical system of reporting. Mind reports to and feeds back self. Self feeds forwards mind. Self reports to and feeds back systems-independent consciousness. Systems-independent consciousness, in turn, feeds forward self. Life and self maintain a tangled hierarchy and feed forward and feedback each other instantaneously. 'Life' offers strength to mind. 'Life', because of its access to new information, can alter the logic modules in the global sensor of self. 'Life' does not report to self or mind. Life directly reports to and feeds back the system-independent consciousness. When 'life' finds any incorrigible note of discordance on the ground, it switches on the programmed systems death (apoptosis).

In the paragraph below, we present a model (Figure 1) of this inter-phase accommodating almost all of what has been said. In the model as shown in the figure, operators are shown within the circles. A bowl at the top, which is open to endlessness, represents consciousness. There are three important triangles. Mind handles information. The source of any new information is Life. Information, Mind and Life make a triangularly related operational nugget out of which emerges the objective natural 'world'. Mind, Memory and Self make another triangular operational nugget, emerging out of which is Intelligence with a subjective world of 'I', 'Me' and 'Mine'. There is generation of

ownership and 'ego'-sense.

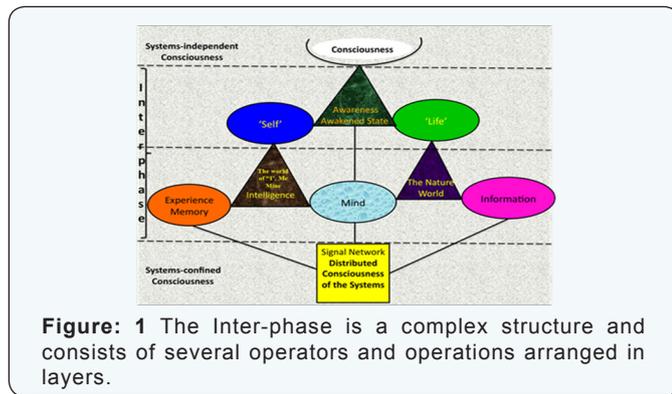


Figure: 1 The Inter-phase is a complex structure and consists of several operators and operations arranged in layers.

At the top, Self, Life and Consciousness are triangulated operationally and the emergent property is awakening of the systems from slumber and sleep, and development of awareness of the contents of consciousness. The price of freedom is eternal awakened state. The triangular relationship between operation of Self, Life and Mind also exists (not shown in the Figure) and is very important for their mutual integrated cooperation in running the systems. Mind has a direct connection with consciousness. Similarly, direct connection with consciousness is there for Life and Self as well. None of Consciousness, Life and Self has direct connection with matter. All three are connected with the matter through Mind. Mind is the final common pathway for connecting the non-observable operations with the observable phenomena at the quantum and classical nests of nature where there are vibrations, space, time, signals etc. The matter is represented by the rectangle at the bottom. Informational molecules at the classical physics level and 'be-able' quantum particles serve as vehicle of distributed consciousness.

The inter-phase appears to be an ensemble of apparently contradictory properties, but has been made possible because of extraordinary relationship of its irreducible autonomous constituents. The processes within this inter-phasing system are multilayered, interlaced, labyrinthine, hierarchically nested. The processes are non-linear and unstable but are happening on the ground of absolutely stable consciousness.

However, like linear process, there is an end-point and that is this consciousness. The processes are neither random nor stochastic, although determined. There are wide fluctuations and oscillations with critical feedback instability maintained spontaneously by self-organization, which make those resemble chaos but unlike chaotic process the outcome is predictable once one knows the principles of the operations. The operations are proposed to work within nature beyond Planck's scale but connected to nature within Planck's scale.

Bottom-up, the model shows how signal at the physical level is in connection with the domain of consciousness at awakened state with contents and wisdom. Top-down, the model shows how will of consciousness is brought down to classical

Newtonian wheel. Thus, it accomplishes the first objective of the paper to bring consciousness within the fold of systems science. When we recognize this inter-phase itself as systems, the model depicts how consciousness distributed within the systems communicates with signals emanating from system-independent consciousness! Here we accomplish the second objective of the paper.

The issues in science for consciousness could be summarized in two interrogative sentences. Bottom-up, how can one link signal with wisdom? Top-down, how free will of consciousness get hold of Newtonian wheel at the classical sensory level? To put it simply, signal to wisdom and wisdom to signal is one way of addressing the issue. The other way of addressing the issue is to investigate how mechanics of consciousness is translated into Newtonian mechanics? With this model, a way has been shown to solve the 'hard problem' of consciousness research!

Investigating the Model further

How does one examine and investigate this inter-phase further? Verification is possible within the cell systems. Research hypothesis is easy to build up by focused understanding on the molecular representation of the operations within the cell [9,10]. For example, there is a hypothesis that mind is represented at the molecular level by protein of Ca^{++} ion channel. As supportive evidence one can state, bacteria in a community communicate with each other through ion channels [11] and resolve stress. When an unconscious patient starts passing urine on the bed his sphincter control (Ca^{++} ion channel) is lost. When a two or three year old child develops sphincter control we say he has developed his first mind control mechanism.

As extension of the above hypothesis, the self is represented at molecular level by proteins of ion-pumps and MHC-I Molecules. The whole immune system works on the basis of self/non-self distinction, which is done through MHC-I molecules. Proteins gluing microtubules with cell membrane is hypothesized to represent 'life', and specific membrane potential protein of the cell represents consciousness at the molecular level. In the case of organ-brain, neurotransmitters could be classified on the basis of their representation of operation of self, life, mind and consciousness. Another model for exploration of the proposition further could be the biohybrid robots with stem cells. This could be a humble beginning for consciousness-centered development of a new medical discipline.

Proposed Time scale from Narrative to Science

To make this narrative a part of systems science is an ambitious project. Generally, science takes a vertical leap every hundred year. The first great leap is expected in this century to unravel the mechanism of transformation of signal into information and vice versa by the operation of mind or mind-like structure and process in nature. As a byproduct, in horizontal expansion of science we will get more into science of mind and

information with a glimpse of dark matter and dark energy, perhaps the fundamental ingredients of all known source of energy. The second expected vertical leap would be on how information is transformed into knowledge and vice versa. The byproduct of this leap would be seen horizontally when we gain access to dark energy, harness it and use it in the visible material plane. This is expected to happen by unraveling the complex relationship between 'life', gravity, dark matter and dark energy, Higgs Boson and neutrinos. The leap may happen anytime in the twenty second century. The third expected vertical leap, as envisaged by the author is likely to be in twenty third century on how knowledge is crystallized into wisdom—which presupposes the development of a science of consciousness, with deciphering the mechanism of how living systems can redefine, rediscover and reinvent them?

Conclusion

The project is thus spanned over three centuries Present twenty first century may see the transition of quantum holography into information holography. The full-fledged development of the science of 'life' is expected to happen in twenty second century. It is twenty third century when the science of consciousness is expected to percolate down into the mass culture of humanity. In this sense we all, who have been working today for developing a science for consciousness, are really working for three centuries ahead.

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