

reflections of such impasses. In all of these, even including those on consciousness debates, we see enormous display of mind-prowess. Impasses demand that we integrate knowledge across domains and function at a level where mind-mechanics does not overwhelm us. Staying beyond the level of mind, at a “non-local self” is likely to provide the required synthesis of approaches. Any society where individuals perform from that level of being has a good chance of experiencing the truth, even if such a system might fail to sustain and survive in the long run. I finally end with a sober thought that no living matter really withers away in the true sense: organisms pass on their gene-pools before they cease to exist (10), even extinct species pass on their living matter to surviving species before they become extinct (11) and all living world constantly exchanges matter and energy seamlessly within itself as well as with its non-living systems. There is no real cessation of life in this continuum.

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Talk 3: Consciousness: Contents, States, Levels, regarding; Synthesis from Neuroscience and Vedanta

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When we take a position that consciousness is an absolute invariant, then it is not possible to study such consciousness by any methodology of science. In the context of systems science, consciousness, however, could be described as systems-confined consciousness. When it is independent of systems, consciousness could be described as systems-independent consciousness. Consciousness, although, is not bound by any systems, having systems means introducing heterogeneity in otherwise homogenous, uniform, unconditional consciousness. With introduction of the systems, such as brain, there is generation of duality or plurality along with this heterogeneity of consciousness. Also during such occurrence, there is generation of a structure and process called ‘mind’, which acts as an organ of communication between two conscious systems. Further, consciousness could be studied better in the systems which is live, systems which is not only self-organized but also life-organized. Thus, mind and ‘life’ within the systems are relevant co-players of consciousness within the systems. Within the live-systems, consciousness itself might be described in two ways, as the ground-consciousness and the consciousness, which is tailor-made, system-customized and operate as chief executive officer within the systems. The executive consciousness within the systems is customarily called ‘self’. Moreover, consciousness as the ground, inside or outside the systems, is neither inert nor non-committal. Consciousness within the systems acts as an active

supportive ground as well as a participating ground, even if it executes its decision through 'self'. As a supportive and participating ground, consciousness looks after what all have been going on in the autonomous operations of self (self-organization), 'life' (life-organization) and mind (mind-organization) of the systems. Mind, life, self, information and consciousness itself are five irreducible constituents of the "inter-phase" placed between system-bound consciousness and systems-independent consciousness.

It is possible to discuss human consciousness as systems-confined brain consciousness with its *contents*, *states*, *levels*, *development lines* and *planes*. This way of description of human consciousness has been observed first in last twenty years in the work of Ken Wilber [1]. However, we would do it within the ambits of systems science with support of available knowledge from neuroscience and without deviating from our worldview that consciousness is not generated within the brain by any kind of interaction or operations of neurons (and glial cells). Consciousness uses the infrastructure of the brain as means for its manifestations.

On the participating ground of consciousness, interaction between 'self' and the systems of live brain results in brain-bound experiences with their respective *contents* (sensory, perceptual, memory etc.). One can become aware of these contents in different *states* of consciousness (wakefulness, dreamy sleep and dreamless sleep). The organizing capacity of the experience and the ability of self to use neuro-informational infrastructure of the brain could create more or less some permanent landmarks, called *levels* of being-consciousness. Levels of being-consciousness are global multidimensional and having characteristic pattern in the behavior, which develop along the three developmental lines. These levels, although more or less permanent, are not fixed or rigid. The levels show biological plasticity so that the being can grow from one level to the other. Being-consciousness at any *level* has access to different *states* of consciousness through self. Besides, the developmental trajectory of consciousness within the neural infrastructures of the brain follows three distinct *lines* along cognitive, psychomotor and affective aspect of development. Planes of consciousness are usually described in the context of description of information processing as unconscious, subconscious and conscious events and also in the context of description of nature-consciousness.

Contents of consciousness

While consciousness could be a generic term, the awareness is always in the context of systems consciousness. Whenever we use the term awareness, the question arises, aware of what? This 'what' is the content of consciousness! The next question is what or who is aware of the contents? The second 'what' is the system and 'who' is the 'self'. The systems/self can become aware of the contents of consciousness. This sense of 'self', 'I', stands between awareness and consciousness. Access of self to the contents of consciousness in various states of consciousness has specific physiological mechanisms through fronto-parietal connections.

Different types of Contents:

Contents could be classified as sensory contents, perceptual contents, emotional contents, affective experiential contents, also as thoughts, memory and imagery contents etc. On the motor front, there are contents of self-talk, autosuggestions etc.

Memory as a content of consciousness:

Memory is the cardinal sign of existence of consciousness (cf: Edelman's re-entry theory of consciousness)[2]. However memory is not the single property by which one can recognize consciousness. Consciousness could exist without memory.

Human being has different kinds of memory[3,4], each kind having a definite neuroanatomical basis. Common forms of human memory require cerebral cortex.

The seat of short-term memory or working memory is the prefrontal cortex.

Long-term memory is of three kinds

- (i) Declarative memory of facts (semantic memory) and events (episodic memory). This is the memory explicit, which could be consciously recalled. This memory is also flexible. The anatomical base of such memory is hippocampal formation and neocortex.

- (ii) Procedural memory is responsible for execution of procedures, skill etc. The infrastructure involves neocortex, neostriatum, cerebellum, brainstem or spinal motor nuclei.
- (iii) Emotional memory refers to conditioned preferences and aversion, involves cortex and amygdala having output through hypothalamus. Emotional memory is also involved in memory modulation.

Unlike declarative memory, which is flexible, the procedural and emotional memory might work below conscious level/plane and are relatively inflexible.

Behavioral distinction between contents and states of consciousness:

While the *states* of consciousness determine the conscious behavior, the *contents* of consciousness determine the automated unconscious behavior of the subject. From the behavior of the subject, thus one can draw a distinction between contents and states of consciousness. Sleep is a state of consciousness and is not an exception to this rule. Automated unconscious movements in sleep are guided by the content of consciousness. In different *states* of consciousness the contents of consciousness may be same or different.

Pathology:

Acute multifocal or diffuse impairment of the contents of consciousness is neurologically called encephalopathy. Psychiatrists call it Acute organic brain Syndrome. Chronic such impairment is designated as dementia. Dementia is debilitating deterioration in more than one domain of cognitive function particularly the memory contents. It is in contrast to single domain deterioration in aphasia (only speech loss) or amnesia (only memory loss).

Contents in the context of Psycho spirituality:

In Patanjali yoga-sutra, the memory-staff has been called *Chitta*. The 'mind' has been classified accordingly such as sense-mind, intelligent-mind, ego-mind and *chitta*-mind. The last one is responsible for storage, retrieval and recollection of information.

Possibility of experiencing Contentless Consciousness:

Could consciousness be contentless within the system? While consciousness could be devoid of any externally originated contents, it still may be full of contents originated internally, as it happens during dream. In dreamless (NREM) sleep (also called *susupti* in yogic terminology) internally originated contents are also absent from consciousness. Dreamless sleep-consciousness could be an example of contentless consciousness in the context of the brain. Everyone has had this experience during dreamless sleep. With practice of meditation, it is possible to remain 'awake' while one's conscious state is that of dreamless sleep. Recently a few western philosophers (e.g. Jonathan Shear from Virginia Commonwealth University, USA, also Associate editor, *Journal of Consciousness Studies*) and the scientists (e.g. John G. Taylor [5,6] Dept. of Mathematics, King's College, London and James Austin, Professor of Neurology and the author of *Zen and the Brain*[7]) have laid emphasis on the empirical existence of contentless consciousness in the context of the brain, which is free of any intentional contents. The experience of *contentless consciousness* in the context of the brain is an experience equivalent of deep (dreamless) sleep while one is awake (*jagratasusupti*) and is often described as the state of *Stithaprajna*.

Contentless consciousness could be experienced as brain-bound consciousness (*jagratasusupti*) as well as brain-independent consciousness. Experiencing contentless consciousness in the context of brain has nothing transcendental to do with it. Experiencing brain-independent non-dual consciousness as contentless consciousness is, however, a true transcendental experience, which transcends the opacity of death. The terms used for such existence and experience are pure consciousness, crystal consciousness, nondual consciousness or *consciousness-as-such*. This consciousness is devoid of any content of internal or external origin. This consciousness also might be synonymous to what have been called ground consciousness of multiple universe(s).

States of Consciousness

States of consciousness indicate the global state of awareness of the systems as a whole (the brain), irrespective of its contents. Contents might be the same or different in different states of consciousness.

While the *states* of consciousness neurologically depends on vertical fibers, with recruitment of the brainstem reticular nuclei, intralaminar thalamic nuclei and diffuse projection over the cerebral cortex, the *levels* (depth) of being-consciousness is dependent on the size of the assembly of neurons, their synaptic connections and the number and quality of information processed and integrated therein.

Different States of Consciousness:

Within the bounds of the brain, the experiential *states* of consciousness are as follows.

1. Three *basic* states of consciousness i.e., wakefulness, dream and dreamless sleep.
2. *Altered* states of consciousness i.e., holotropic, psychedelic states etc.
3. There are also *states of experiencing elementary phenomena* (existential states such as life-death situation, multi-dimensional dismantling of ego, sexually aroused state and when in love).
4. 'Higher' states of consciousness; *the divine/transcendental/spiritual* / 'supramental' experiential state.
5. Finally, there are pathological states of unconsciousness (different grades of coma) and consciousness such as depressive state, manic state etc., or states with organic lesions like 'locked-in' state, vegetative state of consciousness etc.

Basic States of Consciousness:

All animals and the human being pass through three basic states of consciousness. We are awake. We sleep with dream. We sleep without dream. Arousal is a state of behavioral continuum between sleep and wakefulness. To remain awake one requires triangulation of operation of consciousness, self and 'life'. A non-living entity is never awake. Without self, who is to experience the awakened state? In non-conscious systems there is no awakening. From sleepy state to get awakened, self requires operation of 'life' and consciousness. Important in this context is the fact that in the dreamy state there could be permanent loss of some information This has been shown by Crick and Mitchison [8] of shedding/removal of unwanted information during REM sleep. Also important is the fact that during dream, the 'self' may get 'detached' from the brain and even can look objectively what is happening inside the brain. In dream, self is free to travel outside the brain as well. Dream has the potential for creative resolution, discovery and new insights (c.f., Otto Loewi's dream, Thomas Edison's dream, Elias Howne's dream).

Basic states of Consciousness in ancient scriptures:

In contrast to current neurophysiological view of three states of consciousness, *Mandukya Upanishad*, however, describes four physiological states of consciousness: *jagrata* (awake), *swapna* (may be meaning dream), *susupti* (may be meaning dreamless sleep) and *turiya* (the delight of divine ecstatic state). The first three of these states are according to the description of the basic states of consciousness in neuroscience literature.

Higher state of consciousness in Ancient literature:

Turiya state is the experience of ground state of consciousness, devoid of any content, any information or even of the self. Turiya state encompasses other three states; outwardly sensing awakened state, inwardly knowing dream state, sensing and knowing the objectless *prajna* of the *susupti* state of self. Turiya state retains the full manipulating power on all three states and also on self, on quality of information and on content of consciousness.

On the ground of this Turiya state, perturbation of the triangular relationship of consciousness-self-life by physical external stimuli keeps us awake, perturbation by internal mental state makes us dreamy. In absence of physical and mental objects, the *susupti* state makes us experience *prajna, information-as-such*. What we ordinarily call wakefulness is, therefore, not a fully awakened state. Turiya state is our fully awakened state. Since we cannot remain in a fully awakened state of *turiya* forever, we need to sleep and dream and remain awake in a narrow bandwidth state.

Besides *Mandukya Upanishad*, three other Upanishads namely *Brihadaranyaka Upanishad*, *Prasana Upanishad* and *Chandogya Upanishad* deal with the issues of dream and sleep [9]. From the insights in the Upanishads we learn that the senses slumber, the mind dreams, the self behaves differently in awakened and dream state. There is information loss (*Prarabdha/sanchit karma*) and acquisition of new information during dream state. Life-principle

remains awake in the deep sleep (*susupti*) state. All these states and activities therein are supported by the ground state of consciousness (*Brahman*).

Mandukya Upanishad is silent about the layers of states in between *susupti* and *turiya*. Some indications of milestones in this terrain could be found in *Katho-Upanishad*, in the discourse between Yama (God of death) and the Nachiketa (the aspirant to learn) where the skill of voyage through death while alive has been highlighted. We suggest that from *susupti* to *turiya* there are two more nests of nature, 'self' is to pass through and conquer and when this is accomplished one observes two more states consciousness.

In the *Bhagavad Gita*, there are two terms used to denote two important landmarks in the pathway of higher states of consciousness: *sthitaprajna* state and *brahmisthiti*. The best approximation of '*sthitaprajna*' state is the state of awareness similar to dreamless sleepy state (*susupti*) while one is awake (*jagrata-susupti*); a state difficult but not impossible to achieve when one conquers the sleep. *Brahmisthiti* is, in best approximation, the state when the person dwells in the *Brahman*-consciousness. Therefore, if *turiya* state of Upanishad and *Brahmisthiti* of *Bhagavad Gita* are considered as identical, then there are two more states of consciousness in between. Having conquered death and remained alive beyond transcended death consciousness, the 'self' attains a conscious state, which could be named as *brahmabhuta* state. When 'self' itself is conquered, there is complete descent of *Brahman* in the body system and the corporeal *Brahman* starts manifesting as *Brahman-avatar*.

This may, however, be clearly stated here that the state of *brahmisthiti* and of anything beyond is not attainable by mere personal effort. It needs *shakti-pat*, when the *Grace* of unconditional *consciousness-as-such*, or the unconditional bliss from Sadguru directly pours on the primed and prepared brain-bound consciousness, which is elevated to the *state* of *Grace* in case of the aspirant. *Bhagavatam*, in the story of king Trishanku, sage Vishwamitra and Guru Vashista clarifies the necessity of this *Grace* from the highest conscious level

Higher states of Consciousness as described in Neuroscience:

The works of James Austin [7] as well as Eugene G. d'Aquili and Andrew Newberg [10] are relevant here. They have described several states of higher consciousness with their neurological substrates and mechanism like (i) deafferentation and (ii) spill over phenomena [10]. According to Newberg, in the awakened brain state, the focus of brain function shifts from Orientation Association Area (OAA) of parietal lobe (space orientation, distinction of self from others) to prefrontal Attention Association Areas (AAA), linked with unity experience and execution of will.

Altered States of Consciousness:

Temporarily altered state of consciousness is found with psychedelic (Greek word, meaning "soul revealing") experience with certain drugs such as LSD (Alan Watts, Stanislav Grof), Ayahuasca (Benny Shannon), Cannabis, psilocybin mushroom and many others. The experience is often revelatory for some secret working of the brain, often useful for unlearning of wrong habits. The psychedelic agents work by altering the neurotransmitters working in the synapses.

While higher awakened states of (spiritual) consciousness have *heightened integrity* of various subsystems of the brain with *intact insight*, consciousness in altered states is associated with blurred insight and brittle integrity of subsystems. In higher awakened state, the turnover of *inner energy* (information-based energy) within the brain is much higher as compared to the psychedelically altered states of consciousness. Higher awakened state helps in evolution of the being. Altered states of consciousness have no such role.

Pathological states of unconsciousness:

These are basically different clinical states of unconsciousness due to organic brain lesions. Followings are four unconscious states of the neurologically disabled patients [11] before the state of brain death. These states indicate globally deteriorated state of consciousness (Table 1).

Conscious State	Wakefulness / Arousal	Awareness	Pain & Suffering	Communication	Outcome
Emerged from MCS	Open eyes. Intact sleep-wakefulness pattern	Consistent, reproducible	Yes	Consistent and reproducible	Probability of Recovery increases
Minimally Conscious State (MCS)	Open eyes. Intact Sleep-Wakefulness pattern	Inconsistent but reproducible	Yes	None to inconsistent. Reproducible	Variable. Better than vegetative state
Vegetative State (VS) Vegetative means devoid of sensation and thought, although the organic body is capable of growth and development	Open eyes. Intact sleep-wakefulness pattern	No Evidence	No.	Absent. To vegetate means to "live a merely physical life devoid of intellectual activity or social intercourse."	Depends on etiology (traumatic, non-traumatic)
Coma	Does not open eyes. Absence of arousal. Sleep-wakefulness pattern absent	Absent	Absent	Absent	Death/Recovery within four weeks/Evolution to persistent vegetative state/ Evolution to Permanent (non-reversible) vegetative state >6months for non-TBI and >12 months for TBIs
Brain death	Absent	Absent	Absent	Absent	Nil

Table 1. Four Pathological states of unconsciousness before Brain death

Differential Diagnosis of unconscious states:

There are two other states where there is no disturbance of consciousness but come in differential diagnosis of the above pathological states (Table 2).

Conscious State	Wakefulness / Arousal	Awareness	Pain & Suffering	Communication	Outcome
Locked-in State (Pseudo-coma). Cerebro-medullospinal disconnection. De-efferented state. Complete paralysis of all voluntary muscles except eye muscles	Open eyes. Intact sleep-wakefulness pattern	Fully aware	Yes	Consistent. Uses vertical eye-movement. Side to side movement of eyeball is not possible	Recovery unlikely. Remains quadriplegic
Akinetic Mutism (They are not paralysed but lack "will" to move)	Open eyes. Intact sleep-wakefulness pattern	Fully aware	Yes	Their eyes might follow the observer or might be diverted by sound	Recovery unlikely or limited.

Table 2. Two conditions, which mimic unconscious state without having disturbance of consciousness.

Other Pathological states of Consciousness:

These come under several classified psychiatric disorders like depressed state of consciousness, manic state of consciousness, schizophrenic states of consciousness etc. These states are often explained on the basis of concentration of different neurochemicals within the brain.

Levels of Being-consciousness

Are there levels of consciousness, ask Tim Bayne et al in *Trends in Cognitive Sciences* in 2016 [12]. The science has been picking up with the ideas floated and developed by the philosophers long time ago. Levels of consciousness are not arbitrary nor are those described in any intangible sense. Different levels of consciousness are described in the context of the being-consciousness characterized by the specific behavioral pattern of the person. Being-consciousness is consciousness supported by the nature (infrastructure of the systems) of the being. Consciousness alone cannot make a Being. Nature singularly cannot make a being either. The being is a composite reality of consciousness and nature with self as operational unit within the systems.

In the context of the human brain, seven levels of being-consciousness [13,14] could be identified. There are three levels of being-consciousness within the conventional (cortical) realm, three levels in the higher (supracortical) realm related to permanence of different degree of higher awakened states and there is one level of being in between, connecting the two (cortico-supracortical) realms.

Three levels of being at the conventional level:

Three milestones of being at the conventional level of consciousness are (i) brainstem being, (ii) limbic being and (iii) cortical being. This is in consonance with P. D. MacLean's Triune model [15] of human brain. According to MacLean, the human brain is a composite nest of reptilian brain, mammalian brain and the human brain.

"We are obliged to look at ourselves and the world through the eyes of three different mentalities – two of which lack the power of speech. The human brain amounts to three interconnected biological computers, each with its own special intelligence, its own subjectivity, its own sense of time and space, its own memory, motor and other functions".

- Mac Lean PD

These three levels of consciousness could be objectively identified by the characteristic behavior of the being.

The Brainstem being:

Brain stem nuclei are 280 million years old evolutionarily. The being consciousness, although present in crude form even in the predators and the prey, is manifested in an observable way in the human being. This has been made possible because of emergence of self and refinement of connection between brainstem reticular nuclei, intra-thalamic nuclei and the sophisticated organization of cerebral cortex.

Behavior-wise the person could be characterized as follows. He is awake, alert and oriented, oriented to space and time. A royal guard at the gate of the King personifies this kind of being.

The Limbic being:

The paleo-mammalian brain is approximately 165 million years old. The being consciousness is manifestly an improved version with development of limbic nuclei and their total networking in the brain systems. In addition to the features of brainstem being, what one observes in this being is emotion and overwhelming motivation-guided-consciousness to seek pleasure and avoid the unpleasant. Caudate nucleus and putamen within the brain and their connections are implicated in motivations. Amygdaloid nucleus and septal nuclei along with the cingulategyrus and their hypothalamic connections, the circuit of Papez etc., all constitute the emotional brain. Sensual pleasure of the best available quality remains the aim of such being. Basic biological motivation is for hunger, thirst and 'sex'. Sigmund Freud, although, stretched sexuality too far to encompass the entire motivation of human psyche, other motivations that appear originate from other private faces of self. De-conditioning and re-conditioning of 'ego', the conditioned existence within the systems, are other factors of motivation. Pushing the systems in a life-or-death situation could bring out another strong motivation. In the higher being the same motivation is guided by universal love, selfless altruism etc. Limbic system is essential for all such motivated behavioral manifestations.

The Cortical being:

The neocortex, evolutionarily, is approximately 50 million years old. The cortical-being consciousness is human characteristic. The cortical being is characterized by his ability to rein and direct the limbic horse, to unify many diverse facets of consciousness and to exhibit rationality and logic during discrimination. By his discrimination and judgment he can modify his motivation, intention and will accordingly. Cortical being is the rational being. He has the ability of both differential and integral function. Intellectuals and scholars could be said to belong to this category of beings.

The Sandwich state of the being:

It is possible to find a level of being-consciousness, which is sandwiched between the conventional three levels as described above and three higher levels of being-consciousness (see below). This is the level of consciousness of the cortico-supracortical being.

The Cortico-supracortical being

This is a temporary transitory phase of the being in course of transition of the being from the conventional cortical states towardsupracortical direction. The cerebral cortex in such being has 'opened' up informationally towards an unending supracortical domain under elemental existential selection pressure. But the being is yet to get used to full potential of the situation. It is the being who is in the state of re-defining, re-discovering and re-inventing oneself in his transition from universal consciousness to trans-universal consciousness.

The situation is far from equilibrium, extremely unstable and the person swings between the polar extremes and is tossed amongst multiple 'selves'. There is purging of 'nature' in one hand and the creative attempts that are mostly imperfect, on the other hand. In *Conquering the Brain*[16], I have described this phase (p. 134), as 'Integrated Cracked Brain syndrome'. It is cracked, because the components of the brain, the information processing sub-systems and the systems of response within the brain, apparently fall apart. It is insightful and integrated because in absence of this insight and integration the sanity will fail to prevail, the process cannot be visualized objectively by the self and the parts of the whole cannot be re-organized in a new manner. Focal palpation of the brain in such individuals offers a cracked response. The global response is a brilliant integration.

One could observe a constellation of brain 'dysfunctions' during this phase when a) 'self' is being tossed between the 'old' and 'new but yet incomplete' conscious centers within the brain and b) the 'nature' of the being wanders in the boundary zone between sanity and insanity, without ever crossing it, and so the boundary is well-lighted by integrity. It could not be labeled as pathological psychiatric state of the being because of the presence of insight and integrity.

Three milestones of Being-consciousness in Supracortical direction

In the higher supracortical realm there are three levels of being-consciousness namely, (i) supracortical being, (ii) supracortical godhead and (iii) supracortical autonomy. In supracortical being, the sleep has been conquered. In supracortical Godhead, death has been conquered and in supracortical autonomy, the 'self' has been conquered. These levels have probably been called in the colloquial language as the level of saint-consciousness, sage-consciousness and *siddha*-consciousness (also described by Wilber). According to the Vedantic tradition of India, these three levels might be the level of consciousness of a *Brahamachari*, a *Swami* and a *Paramahansa* respectively.

Common characteristics of the Supracortical beings:

Supracortical being, Supracortical Godhead and Supracortical Autonomy are beings in permanent supracortical direction. All three levels of being-consciousness are characterized by three common features; (i) Inexhaustibility (within cortical limits), (ii) Love and (iii) Creativity. The difference could be found in the gradation of manifestation. One could correlate this with brain's graded accessibility to different depths of voids around the cerebral cortex. In the direction of supracortical being hood, Creativity and Aesthetic values exhibit a co-evolution. There is an objective self-transparency in behavior associated with varying complexity as the brain continues to biologize the trans-universal consciousness. Autonomy is entrusted by nature to the new neuronal systems as it achieves the desirable level of perfection.

Supracortical 'opening' offers five right conditions necessary and probably sufficient for creativity: (i) co-habitation of masculine (Consciousness) and the feminine (Mother Nature) components, reflected as the behavioral trait of 'independence' and 'sensitivity' respectively in the person's behavior (ii) 'space' necessary for any creative feat (iii) a stable value attractor, (iv) with positioning of self at the 'boundary' zone (cortico-supracortical domain) which is far from equilibrium and (v) operational freedom.

The creative space in the brain following a supracortical opening is literally and practically infinite. Following supracortical opening there is an attempt for formation of a phenomenological integration center at the vortex of the brain, which starts acting as Supreme Biological Homeostatic Center, the *Brain* of a brain. This is a rudimentary form of a new center formation at the material biological level, which acts as a stable value-attractor in midst of chaos. Because of operational freedom of 'self' it can move in and out of the subjectivity-objectivity boundary and could 'invert' subjectivity into organic objectivity using different dimensions and different information-states from the deeper nests of Nature. Operational freedom and sensitivity of self, which has positioned itself as the operator at the cortico-supracortical boundary that is far from equilibrium, offer an unparallel advantage for creativity.

All interesting and exciting events happen on the boundary. And, the boundary between the cortex and the supracortical domain is the most exciting one in the context of evolution of such beings [17].

Specific characteristics:

1. Supracortical Being

He has a stable supracortical root. In spite of that he is seen to fluctuate between his cortex and the supracortical domain. He is the being in formative stage for further evolution in supracortical direction. He aspires for the best, the purest, the highest and the perfect. He may get disappointed in failure but never comes down to be rotten and is never out of the tract in trajectory of evolution.

2. Supracortical Godhead

Two important additional characteristics in such person's behavior are appearance of (i) 'magnetic attractability' and (ii) contagiousness in the behavior of the being. His inexhaustible Love and remarkable discriminative power arm him to make a flawless decision in most of the worldly games. The cortical systems of this being has become so perfect that the Supreme Nature, the Mother Nature, deems it proper to use his brain as her transmissive organ for manifestation.

3. Supracortical Autonomy

When one's nature becomes Mother's Nature, one is consciousness. Unconditional consciousness and Mother Nature gets personified/embodyed in this Being. The 'spirit' of this individual becomes a personal agenda of Unconditional Consciousness and the 'intent' of this individual reflects the intent of trans-universal Mother Nature. This personification exemplifies how Transuniversal essence, the Essence of multiple universe(s) has been behaving within the individual systems framework, how the transcendental inhabitant works within immanent crystallized nature, how the 'Divine' is embodied and the 'Absolute' is personified as ever reassuring. In Vedantic tradition of India he is called *Sadguru*, exemplifying the *culmination of genetic, memetic, informational and all conscious processes of Individuation*.

Because of the enormous degree of perfection of the brain, the being is conferred an absolute and complete autonomy at the highest level of pluralism, as found in the context of the systems of multiple universe(s). That is why the being is described as supracortical autonomy. He is the *First Person Universal* swimming comfortably in the *Interuniversal Essence*. As a person, he is at absolute ease. No constrain, whatsoever, could be noticed in his behavior. He dwells in Ananda. His behavioral expressions are characterized by (i) an eternal 'yea', ever reassuring and (ii) endless 'love' melting from 'pure disinterested altruism'.

The state of *Stithaprajna* (*Bhagavad Gita*, 2/55), *Brahmabhuta* (*Bhagavad Gita*, 5/24, 6/27 and 18/54), *Brahma-Avtar* and *Brahmistitha* (*Bhagavad Gita*, 2/70-72) as described earlier, when personified as being-consciousness probably becomes similar to the present description of being-consciousness as supracortical being, supracortical godhead and supracortical autonomy respectively (Table 3).

	Sthithaprajna	Brahmabhuta	Brahmavtar/Brahmistitha
Relation to sleep & death	Awake in the deep sleep (NREM) state	Alive following transcendental and transformational death experience	Consummated with Supreme Self.
What has been conquered?	Sleep	Death phenomenon	'Self'
Cosmological Awareness	Beyond the solar and planetary system, stably dwells in the interstellar space.	Beyond the galactic system, dwells in the intergalactic space till the boundary of the universe.	Beyond the boundary of the universe, within the Essence of the Multiversity
Accomplishment	Nonattached calmness. The peak accomplishment of a <i>Karma-yogin</i>	Still peace infreedom. The peak accomplishment of a <i>Jnana-yogin</i>	Transcendental divine delight. The peak accomplishment of a <i>Bhakti-yogin</i>
Yet to be accomplished	Sacrifice of Intellect, Self	Sacrifice of Self	Continued open-ended relationship with Supreme Self
Closest approximation	Supracortical Being 'Saint' 'Brahmachari'	Supracortical Godhead 'Sage' 'Swami'	Supracortical Autonomy 'Siddha' 'Sadguru' 'Paramahansa'

Table 3. Distinction of three higher levels of being-conscious

Developmental lines of Consciousness

Development is an inevitable consequence of the process of education in experiential. Education is defined as to bring desirable changes in the behavior of the learner in terms of knowledge, skill and attitude, therefore taking care of cognitive, psychomotor and affective aspects of brain functions. Developmental lines in the process of individuation are therefore only three; Cognitive, Psychomotor and Affective aspects of the brain development.

Developmental lines in Vedantic tradition:

When these development lines of brain for education in experience are considered for connecting brain-bound consciousness (*Jivatman*) with brain-independent consciousness (*Paramatman*) using self-consciousness (*Atman*) as tool, one gets to understand three ways of yoga. Yoga is the skill to connect brain-bound consciousness with brain-independent consciousness with the help of self-consciousness. Also, “*Yoga karmasusukaushalam.*” Yoga is the skill, which brings down the operation of consciousness (say, the decision, the “will”) to the level of Newtonian wheel (classical mechanics). Easier said than done! It requires extensive and intensive *Sadhana*.

Developmental lines of consciousness are to ‘connect’ gradually the limited system-bound consciousness with the ‘Higher’, finally with the ‘Highest’, the Supreme, the Purushottama. Development takes place in an extraordinary combination (Bhagavad Gita 18/78) of the presence of the Lord (Yogeshwar Krishna) and the Aspirant (Dhanurdhar Partha). Yoga is the meeting point of this ‘Ascent’ and ‘Descent’ as described by Sri Aurobindo. Unknowingly, all unicellular life forms are in ‘yoga’ because of their locus standing at the boundary of nature within Planck’s scale and nature outside Planck’s scale. For a complex system, it is the union of systems-bound consciousness and systems-independent consciousness! In the human systems it is between aspiring brain-bound consciousness and the gracious brain-independent consciousness. For bringing this concept in neuroscience, we require to explore this *interface* and *inter-phase* in the context of the brain. We have called this interface supracortical consciousness. This kind of sandwiched inter-phasing is essential for phase-transition of system-independent consciousness to systems-bound consciousness and vice versa. Otherwise, as Sri Ramakrishna has told, the mud-hut of human body would be destroyed by such entry of a wild elephant! Or, a 10-watt electric bulb would be fused with 1000 volt current! Development of this inter-phasing makes this communication possible. The whole purpose of yoga is to help develop this inter-phasing mechanism over the cerebral cortex. We have also mentioned of five irreducible constituents of this “inter-phase” in the introductory paragraph of the paper.

Three valuable scriptures, which facilitate growth along these three developmental lines, are Upanishads (for knowledge), *Bhagavad Gita* (for skill) and *Bhagavatam* (for attitudinal disposition).

Jnana-yoga is concerned with developmental line of the cognitive aspect of the brain in supracortical direction, Karma-yoga is concerned with developmental line of psychomotor aspect of the brain in supracortical direction and Bhakti-yoga is concerned with attitudinal aspect of the brain in supracortical direction.

Raja yoga is concerned with development of a psyche, unique in the sense that its starting point is not the established developmental lines of brain-consciousness. It starts with the psyche, which could be brain-bound or brain-independent. The development of conscious brain follows as consequence.

Hath Yoga is a misguided tour in the developmental lines of brain-consciousness since its aim degenerated into gaining control over the autonomic nervous system. In supracortical parlance, the aim of development of the brain is to make the cortical system so perfect that nature eventually confers autonomy to the cerebral cortex as it happens in the being like supracortical autonomy.

Developmental lines of consciousness in different behavioral contexts:

These three developmental lines deal with different aspect of behavior. They work for different accomplishment. There are mantras to activate these lines (Table 4).

	Affective line of Brain development	Cognitive line of Brain development	Psychomotor line of Brain development
1. Deals with	Emotion	Cognition	Conation
2. Works for	Acquisition of required attitude	Acquisition of knowledge	Acquisition of skill
3. Achieves accomplishment in	Delight	Truth	Freedom
4. Related to response of one or the other of the three fundamental questions of <i>Prasna Upanishad</i>	What is <i>Brahman</i> ?	What is Self?	What is this World?
5. Mantra as information on the 'Divine', which helps in development of consciousness along the stated lines	<i>Om</i> <i>Ananda</i>	<i>Tat</i> <i>Chit</i>	<i>Sat</i> <i>Sat</i>

Table 4. Developmental lines in different behavioral context

Planes of Consciousness

The term like planes of consciousness is usually used in the context of description of nature-consciousness and in the description of conscious subconscious and unconscious processing systems in the brain.

Planes in the context of Nature-consciousness:

In the context of nested hierarchal organization of nature, the planes are used synonymously with nests of nature. In my work, *The Millennium Bridge*, [18] there are description of five planes/nests of nature-consciousness, namely (i) classical plane/nest (ii) quantum plane/nest (iii) elemental plane/nest, (iv) plane/nest of Mother Nature and the (v) plane/nest of *consciousness-as-such*.

Consciousness has graded manifestation along this nested hierarchy of nature. A molecule, which works in classical plane is supposed to be less conscious than an electron or a positron, which are working in quantum plane. A photon that is beyond the polar opposites of positron and electron, is supposed to be more conscious than any of the two. Information is more conscious than a photon. 'Life-principle' is more conscious than information. 'Self' is most conscious in comparison to other members of the psyche.

Planes of conscious, subconscious and unconscious processing within the brain:

There is a 'huge' subconscious underneath the conscious processing systems of the brain. This is 'huge' in terms of size, capacity and efficiency. In contrast to conscious processing, which is in tandem and is under supervision, in subconscious there are simultaneous parallel processing and multiple processing of millions of information without supervision, analysis, decision, judgment or brakes. Unlike conscious, which can work in all three modes of time (past, present and future), subconscious works only in present mode of time. Subconscious is mightier than conscious and in case of conflict can sabotage conscious activity. Subconscious determines our automated reflex behavior of rigid nature while conscious processing determines our conscious flexible behavior.

While mostly anterior part of the brain such as prefrontal lobe, and the cerebral cortex are involved in the conscious processing, in subconscious processing involved are posterior parts of the brain, and subcortical structures such as thalamus, basal ganglia and hippocampus etc. Delta (0-4 hertz/sec) and Theta (5-8 hertz./sec) waves are contributions of subconscious towards EEG. Alpha (8-12 hertz/sec.), Beta (12-35 hertz/sec.) and gamma waves (>35 hertz/sec) are contributions of conscious processing.

One important fact to remember is that conscious processing cannot go on without this support of subconscious systems. There are subconscious perception and subconscious memory (implicit memory), which control behavior. There also happens subconscious learning. While 'mythos' enriches the subconscious, 'logos' sharpen the conscious domain of the brain. The culture, which is rich in mythology, contributes for a well-built 'subconscious' in the brain of their members. On the other hand the culture which is 'modern' and the pillars of modernity (namely secularism and western science) supporting it, has well developed 'conscious' in the brain of

their members[19]. Besides, there is a magnificent role of subconscious in creativity. There are three known clinical situations in Psychiatry when subconscious spills over and appears as conscious; in depression, in amnesia and in schizophrenia.

In the context of subconscious processing inside the brain, it is possible to demarcate four planes 'down' the plane of classical awareness. (i) Plane of Fringe consciousness (ii) Plane of Implicit processing (iii) Plane of Fringe unconscious and the (iv) Plane of rock-bottom unconscious.

Subconscious Planes of nature vis-à-vis subconscious planes in the brain:

Just like four subconscious planes in the brain there are four corresponding sub conscious planes in nature-consciousness as shown in the following Table 5.

Subconscious planes in the context of brain-bound consciousness	Subconscious planes in Nature-Consciousness
1. Plane of Fringe conscious	1. DNA/RNA world
2. Plane of Implicit processing	2. Tide, Monsoon etc.
3. Plane of Fringe unconscious	3. Stream, Fountain
4. Plane of rock-bottom unconscious	4. Rock, Mountain

Table 5. Various subconscious planes within the brain and in nature

The Role of Self

The self has *free access* to a) various states of consciousness b) all developmental lines of consciousness c) the ladder of being-consciousness and d) five nests of Nature-Consciousness or planes of various subconscious levels within the brain and to e) get associated with different 'content' of consciousness.

The self also has the *ability to identify* with any content, state, level, plane or developmental line of consciousness and therefore can create a specific self-identity that has specific need and propensities. An individual, who could use the specifically tuned self-consciousness as tool, could therefore 'tap' the inexhaustible source of brain-independent consciousness for its manifestation through brain-bound consciousness. Self, left spiritually disinclined, is likely to get engaged in politics (of identity).

Extraordinary Properties of the Brain

Dara Sikoh argued that holy Quran could be interpreted in the light of Upanishads. His pretext was Upanishads, the context was the holy Quran and the text was his interpretation. We feel there is a long waiting for developing such atextin the pretext of Vedanta casted in the context of available facts of neuroscience. This, however, requires a new vision to look at the organ brain. The brain is not merely a kind of matter, the way both materialists and philosophers often think of. The brain is alive matter. The brain is a systems conglomeration of billions of neurons and glial cells (the brain is rather a bag of bugs rather than a soft-ware packed computer!) and seems to be the pinnacle organ of the human systems. The brain is the inter-phase between systems bound-consciousness and systems-independent consciousness. We will conclude this paper by highlighting some of the extraordinary properties of the brain for further synthesis of neuroscience and Vedanta. Of the five vital organs of the body namely brain, heart, lungs, liver and kidney, the brain is distinct in several senses.

1. The organ brain is the 'local' playground for 'nonlocal' players such as consciousness, mind, self, life and information. The brain has bridged the domain of matter and the domain of consciousness through the complexity of systems psyche.

2. The brain, although, appears as the seat of conscious awareness, is itself an unconscious organ of the body. Except on its three protective meanings, there is no receptor for any kind of sensation in the brain. One could cut, pulp, and lacerate the brain without experiencing any pain or any untoward sensation. Therefore, the conquest of brain seems to be the conquest of this 'unconscious'.

3. The researchers fall into the hands of a paradox when they venture to investigate brain with their brains. No one explores heart by another heart or explore tooth by another tooth. However, researcher's brain only could explore the brain. We like to go beyond the brain along with the brain! We experience the domain that is beyond

the brain with the brain we have! In an attempt to realize this paradox and move ahead, the author uses the concept of supracortical consciousness.

4. The brain has some similarities with the composition of the universe. The number of stars, number of galaxy and number of neurons inside the brain is almost identical, 10^{11} . The *primal essence* that drives 10^{11} neurons and almost similar number of astrocytes within the brain is also the “driver” of 10^{11} stars in a galaxy and 10^{11} galaxies in the universe (c.f., the essence in Brahma Gyatri mantra). As 1% of the universe consists of visible matter, so 1% of energy consumption accounts for visible extrinsic functions of the brain. “The brain apparently uses most of its energy for functions unaccounted for – dark energy in astronomical terms...” “The challenge of neuroscience is to understand the functions associated with the energy consumption” [20].

5. The brain, as an organ, has some unique characteristics:

(i) As an organ the brain has both ‘horizontal’ and ‘vertical’ evolutionary components, probably meant for corporatization of two important dimensions of nature. The consequence of horizontal growth is lateralization, development of left and right hemispheres. So, there are brainstem-, limbic- and cortical-consciousnesses in vertical direction. Saturation of growth in horizontal direction perhaps inspires the organ to grow vertically. Vertical block may stimulate the organ to grow horizontally.

(ii) While the other organs like heart, lungs, liver kidney have a limited predictable ways to respond to a given stimulus, the brain has wide-ranging choices. Intraspecies variation in response of the brain to a given stimulus is incredible! Probably it could be explained on the basis of differences in conditioning of a developed ‘self’ and complexity of neural networking.

(iii) Unlike other organs, at least some parts of the brain periodically go to restive phase (e.g. sleep). The exact purpose of this sleep is not clear. However, the brain goes ‘mad’, loses its sanity if it is compelled to keep awake beyond a critical period of time.

(iv) Probably the brain is the only organ in the human body systems that acts locally and has the ability to communicate nonlocally. No other organ of the body has this ability.

(v) No other organ of the body dreams or imagines! The brain does! Probably the brain is the only biological organ, which is ‘open’ to the deeper recess of nature through transcortical routes! Supracortical consciousness, in this sense, is an interface, and this interphase between system-bound consciousness and systems-independent consciousness is our prime research frontier [21].

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Indian Council of Philosophical Research (ICPR) Sponsored Session: Contribution of Vedānta for the Development of Frontiers in Life Sciences

Part – II: Synthesis of Science and Vedānta



Talk 1: Yoga Psychology and Post-Modern Science Achinta J. Yajnik, Ph.D.

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Abstract

Age of Enlightenment with the Herculean success of science and technology, though provided mankind with the life of comforts and physical amenities, it paralleled with the life of stress and anxiety filled with loss of meaning and purpose of human existence. The mechanistic world-view upon which the whole edifice of science is erected viewed universe as machine, life as mechanical byproduct of matter and human being as robot. The success of this mechanistic paradigm in description, explanation, prediction and control of phenomena belonging to physical sciences, life sciences and even psychology, sociology and politics ultimately led to existential vacuum which constituted the greatest complaint of 20 th century man as the American psychiatrist Victor Frankle says. Abraham Maslow said that the root of this crisis lies in the wrong concept of man, i.e. the mechanistic one and it is a responsibility of a psychologist, according to Maslow, to provide mankind with a proper concept of man and he must take this responsibility with a "weight of duty" and "sense of mission". This being so an attempt is made here to provide a holistic concept of man underlying consciousness principle, based on Samkhya-Yoga system of philosophy and its hypothetical constructs like tanmatras, senses, mind, soul or self as transcendental consciousness etc are validated through empirical findings of physics, biology, parapsychology and psychology. The parallels between Eastern psychology and Western sciences are drawn and holistic synthesis is presented.