

THE PHYSICS AND ELECTRONICS OF HUMAN CONSCIOUSNESS, MIND AND THEIR FUNCTIONS

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ABSTRACT: Human consciousness, the result of breathing process as dealt with in the Upanishads, is translated into modern scientific terms and modeled as a mechanical oscillator of infrasonic frequency. The bio-mechanic oscillator is also proposed as the source of psychic energy. This is further advanced to get an insight of human consciousness (the being of mind) and functions of mind (the becoming of mind) in terms of psychic energy and reversible transformation of its virtual reflection. An alternative analytical insight of human consciousness and mental functions to other theoretical approaches is developed based on Upanishadic insight and presented.

That reversible transformation of virtual psychic energy reflection termed as *maya*, creating various consequential / parallel / simultaneous conscious-states, phases, cognitive and communicative states, modes of language acquisition and communication, and kinds of function of human mind is visualized. The concept is extended to delineate form, structure and functional mechanism of human mind and to know how it facilitates human mental acquisitions, retentions, communications, including language abilities. This proposal is extensively discussed and the hardware and software of mind as envisaged in Indian philosophical systems are put forward.

All this presentation is translated to neurobiology in terms of brain wave modulation / demodulation terms. Also a preliminary proposition of physic-chemical nature of human thoughts and ideas is given.

KEYWORDS: Physics of human consciousness and mind; Electronics of human mental functions; Phases of mind; Cognitive and functional states of mind; Physicochemical nature of ideas, thoughts and utterances; Upanishadic Insight

INTRODUCTION:

The study of the human consciousness, mind, their nature, structure and function is generally believed to be a subject matter outside the realm of the disciplines of physics and chemistry (Taylor and Green 2002). Many scholars feel that the study of human consciousness belongs to the domain of philosophy and psychology and concepts of physics and chemistry are not sufficient enough to explain the nature, structure and function of human consciousness and functions of mind. Such *feelings* convey that the consciousness of living organisms certainly cannot be described in terms of physics and chemistry, even though the neurophysiologists can describe the working of the single neuron in physicochemical terms.

Scientifically, human consciousness, knowing, perception, reasoning, intellectual abilities, understanding, experience etc., are mental processes of the vertebrate human-being, belonging to *Homo sapiens* species. Thus human consciousness and mental processes are biological, involving physicochemical energy transitions and transformations relating to brain, spinal cord and the nervous system (Guyton and Hall 2004; Blakemore (1977). Proteins, as hormones and other classes, which are made up of amino acids that are oriented in space as poly-peptides, are one of the basic macromolecules that take part in these cognitive processes together with neurons. All this is the hardware part of human consciousness, mind and mental functions and relates to neurology and physiological psychology disciplines.

Thus human consciousness is a biological entity and activity present in humans and hence has to be amenable to be understood in physicochemical terms as any other biological phenomenon. Human consciousness is the awareness of mind (Guyton and Hall, 2004, Blakemore 1977; Radhakrishnan 1994; Ramabrahmam 1997, 2004, 2005a, b). Mind, which is an expression and part of consciousness, is an aspect of human body. Mind does all human mental functions which are physiological processes. Thus psychology is physiology. And mind has also to take care of the software of physiological functions.

As visualized by some, consciousness is the collection of millions of neurons and their electrochemical states, even if we have no real knowledge of chemical nature of thoughts and ideas. According to them, we neither have understood completely how living organisms originated and evolved. They feel that we may not be able to define precisely what life is nor whence it came from. All that we can do according to them is to describe the observable phenomena that distinguish living from non-living matter.

Mathematics and modeling by computational activity can explain understanding and consciousness. About 2300 years of philosophy, 100 years of mathematical logic and 50 years of computational intelligence have been trying to understand human

consciousness and model its form and function, and still a clear model is eluding scientific community (Perlovsky 2001- chapters 11 and 12). Theorems and other concepts developed by Gödel, Turing, Penrose and Putnam on mind and machine have not been sufficient to model intellect, understanding, experience and other mental processes. (Perlovsky 2001) and Penrose (Perlovsky 2001) sustain that the brain activity responsible for conscious understanding must depend upon a *physics* that lies beyond computational simulations.

Further, we are yet to formulate neural structures of consciousness. “The Physics of spiritual substance” is yet to be proposed and develop. We have also to understand the physics of the nature of free will and the creativity mysteries. We have also to probe and determine whether consciousness is a hitherto not known new physical phenomenon. A future direction for this research lies in the path to understand the physical nature of the symbol and emergence of consciousness.

Many researchers are trying to understand consciousness through quantum field concept and quantum mechanical ideas. As human consciousness and mental functions are biological phenomenon, how far quantum field theories and quantum mechanical ideas can help in this regard is debatable. An analytical approach is followed in this presentation in parallel to and separate from quantum mechanical, quantum field and other theoretical propositions, approaches and presentations.

Cognitive sciences often rediscover philosophical analyses painstakingly (Perlovsky, 2001, Bitchel and Abrahmsen, 1989, Bobrow and Collin, 1975, Changeux and Dehaene, 1989, Donald Michie, 1986, Elaine Rich and Kelvin Knight, 1991, James Allen, 2003, Partridge and Wilks, 1990, Stuart Russel and Peter Norwing, 2003). A better policy to understand and model human consciousness and mental functions would be first to learn what philosophy (Eastern or Western) teaches us about human consciousness and mind in this regard, and then move on to experimentation and model-building within the scope of positive sciences (Paul Gochet 1995). The aim of this research paper is to present such a possibility of using *Upanishadic* insight to understand and model the form, structure and functions of human consciousness and mind, and to provide as well necessary hints to develop software which would model the tasks of mind. Pure consciousness or unoccupied awareness and self-consciousness and occupied awareness are identified, defined, classified and discussed on mind and its functions together with fresh insight based on Indian philosophical systems.

We can provide the physics behind these constructions and functions of consciousness and mind and also the software from such an understanding to mimic them in mind-machine models. Using quantum mechanical concepts and other theoretical methods and approaches for this understanding is one way (Atmanspacher,

2007). Translating the ideas and expressions available in Eastern or Western philosophy about human consciousness, mind and mental functions into an intelligible language for modern intellectuals and scientists is another way. In both the cases the matter and energy-forms involved have to be scientifically identified and presented in an agreeable way about mind, psychic energy and matter and their inter-relationship.

The processes conducted by the nervous system help the organism (humans) in cognition and communication. The participating matter is biological, acting and interacting in solid, liquid, gaseous and ionic phases of matter simultaneously. Many forms of energy, like mechanical, electro-chemical, biochemical, too participate. Thus, human mental processes are physicochemical energy transitions and transformations relating to brain, spinal cord and the nervous system. As pointed out earlier, proteins are one of the basic macromolecules that take part in these cognitive processes. All this is the biochemical and biophysical part of human cognitive system.

Ancient Indian insight as revealed in the *Upanishads* and their off shoot the *Brahmajnaana / Aatmajnaana* has a lot to say about human consciousness, mind and their form, structure, and function (Radhakrishnan 1994; Ramabrahmam, 1997, 2004, 2005). The expressions of the *Upanishads*, when translated into the modern scientific terms will benefit the fields of physiological psychology, neurology; the natural language comprehension branch of artificial intelligence, and the modeling of human cognition, language communication and understanding processes – the mind-machine modeling.

2. NEUROBIOLOGICAL INSIGHT: (GUYTON, 2004)

The nervous system is a communication network that controls and coordinates most body activities. Every thought, memory, emotion or sensation a person has and every action she or he carries out is a reflection of the activity of this system. In addition, the nervous system works unnoticed to regulate a multitude of internal events, such as modulating body temperature or altering heart rate, in order to maintain **HOMEOSTASIS**—the state of balance and stability that exists inside a healthy body regardless of changes in external and internal environments.

Making up this communication network are trillions of interconnected neurons, or nerve cells that extend throughout the body. These cells are unique in their ability to transmit electrical signals, called nerve impulses, at high speed, so that the information needed to run the body can be collected, processed and distributed in a split-second, and is constantly updated as the body's internal and external environments change.

Three linked functions drive the nervous system. First, sensory input is provided by millions of sensory receptors that monitor changes—called stimuli—taking place inside

and outside the body. Secondly, a processing and integration centre analyses, stores and collates sensory input and makes decisions about what actions should be taken. Thirdly, a motor output activates effectors—either muscles or glands—resulting in a response. So, for example, seeing a charging elephant (sensory input) means danger (processing and integration) so the leg muscles are activated (motor output) to effect an escape.

The nervous system has two main parts: The central nervous system (CNS) consists of the brain and spinal cord and it fulfills the function of processing and integration described above. The peripheral nervous system consists of cable-like nerves that are made up bundles of two types of neurons. Sensory neurons carry sensory input from receptors to the CNS, while motor neurons transmit motor output from the CNS to muscles and glands. Motor neurons fall into two groups. Those of the somatic nervous system carry signals to skeletal muscles in order to make them move. The motor neurons that make up the autonomic nervous system (ANS) control involuntary activities, such as breathing rate and digestion, by activating glands and other organs. Thus the nerve system extends throughout the body to provide high speed coordination and control network and at its core are the brain and spinal cord which receive and send out messages along the nerves.

3. CORRELATION WITH *UPANISHADIC* INSIGHT:

Indian orthodox philosophical systems have thrown light on both software and hardware aspect of human consciousness, mind and their functions in their own way. They have dealt with phases of mind / domains of mind / mental – activity. They classified mental activity as five domains of knowledge/knowing: which happen as a series through cognition process and are retraced in just the reverse way during communication process. Static state of mind, the mood, – state of sense; experience; understanding; instinct; intuition; insight; urge; meaning; verb; volition; biochemical potential energy are talked about and also the dynamic or kinetic state of mind : - transformation of energy – perception / sentence / feeling / thought and expression through vocal chords.

3.1. Life systems and possible delineation of Atman:

Life systems are auto-driven, -functioning and –dissolutions. But they have to have an initiator, sustainer and terminator within the system and with the system for various processes taking place in the living system. Such a ‘thing’ in humans and other vertebrates is called ‘*Atman*’¹.

Srestaprana, (most possibly O₂, and the consequent rhythmic gaseous exchange

taking place in the lungs)) is given as the body (*tanu*)/form/structure of *Atman* (Vasista Ganapathi Muni 1982, 1994). Thus '*Atman*' must be made of O₂ or CO₂ components of air which is inhaled and exhaled. So *Atman* is a rhythmic oscillator which is made up of O₂ or CO₂ issuing out energy pulses that start, sustain and guide the life systems.

3.2. *Form of pure consciousness and mental awareness - the ingredients of human consciousness:*

The above concept about *Atman*'s (Self) existence is proposed by the Upanishads can be understood as follows. Upanishads are source-books of *Atmajnana*, the Knowledge of the Self. Upanishads construe the state of *Atman* or Self as the real 'I' state. Upanishads say that the 'I'- awareness is human consciousness. They understood the state of Self - *pure consciousness* or *unoccupied (mental) awareness* - as the *real* identity of "I", and proposed that state as the natural, original and ground state of human mind (Ramabrahmam 2005a, 2007a) When studied with an open mind and further contemplation, it becomes clear that *Upanishads* are actually *texts of science on human mind* (Ramabrahmam 2007a) The Knowledge of Self as revealed in the *Upanishads* is an *integrated psychology* in mental energy-presence and transformation terms (see also Table I).

3.3. *The scientific insight of Pure Consciousness and mental awareness and functions based on above presentation: The Being of mind*

Atman provides pure consciousness and it is the human consciousness and has following structure: Human consciousness, in the form of and characterized by *Being-Pure Consciousness-Bliss* is:

i) an *Oscillating Energy-Presence* i.e., an infrasonic bio-mechanical oscillator, which is the result of breathing process and the subsequent rhythmic gaseous exchange in the lungs, issuing out mental energy pulses frequency of 10 Hz (a time-period of 10⁻¹ sec) is the real source of mental energy, the *Being of Mind* and

ii) its reflected (in *medulla oblongata* or *reticular formation*) *virtual* energy-pulse series (*becoming of mind* – mental awareness) together constitute human consciousness and are the ingredients of human consciousness and mental functions and language acquisition and communication abilities (Ramabrahmam 2007a)

Human consciousness based on this proposition can be viewed as comprising of Pure Consciousness (*Being of Mind*) and Awareness (*becoming of mind*). *Atman* (mental or psychic energy source) takes care of the consciousness part and *maya* (reflected mental energy virtual form) and its forward and reverse-transformations take care of the awareness part. Thus *Atman* is proposed to be an *infrasonic* mechanical oscillator giving out mental energy pulses of frequency 10 Hz (time-period of 10⁻¹ sec.) 10 Hz is the frequency of this mechanical oscillator according to both western science and eastern

philosophy and theory of language acquisition and communication [4-8]. The enormous number (300 million) and surface area (70 square meters) associated with alveoli constituting this bio-oscillator/ bio-maser produces enormous amount of mental energy though the frequency is in the infrasonic range. A period 10^{-1} of a second, the time required to pronounce a short syllable like 'a' is put forward as the time- period of this oscillator (Krishnamurty (1946); Ramabrahmam,, 2009b). [It is interesting here to mention that the mental rhythms detected by the experiment by German scientist Hans Berger using EEG (electro-encephalogram) also have the same time- period of 10^{-1} sec] (Adian and Matthews 1934).

3.4. Physical Optics analogy of form of pure consciousness-Being and mental awareness and functions-Becoming of mind:

The famous bi-prism experiment of Fresnel in physical optics studies describing and explaining the formation of interference pattern of dark and bright bands on a screen from a point light source is a very apt analogy to state, describe and understand the *real* nature of the *Atman* as an oscillating source of mental energy and the virtual (*unreal*) nature of *maya* (psychic energy reflection) as reflected virtual mental energy pulse series. *Atman* is similar to the point source of light and *maya* to the virtual (unreal) source(s) formed from light reflections in the bi-prism. As is known, the two virtual sources thus formed in turn serve as the two coherent sources responsible for the formation of interference pattern during which process the *real* point light source remains *untouched* and *unchanged* but its presence is essential for the formation of the virtual (*unreal*) sources and consequent interference pattern. So also transformations of *maya* (psychic energy) give rise to various mental phases, functions and activities, while source of mental energy, *Atman*, is *untouched* and not transformed but is essential for the existence of awareness as (human) consciousness and simultaneously for the awareness of activities of the mind and body as transformations (beings / becomings) of *Atman* and *maya*. Thus mental energy pulse series reflected in *Medha*, (*can be medulla oblongata or reticular formation?*) termed as *maya*, are virtual (unreal-*mithya*), but are same in content, form and nature as the real mental- energy presence (*Atman*) just as reflected light energy is same as light energy from source in content, form and nature. *Maya* is also known as reflected *chit* and or primordial sound (Ramabrahmam 2007b).

Thus according to *Upanishadic* insight, also known as *Brahmajnaana / Aatmajnaana*, *Atman* (the psychic energy source and presence) and its virtual reflection, *maya* together constitute and compose of human consciousness and are the ingredients that construct and operate human consciousness and human mental functions (Ramabrahmam 2009a,b). A physics and communication engineering model of human cognition, language acquisition and communication based on *Upanishadic* expressions

and *Sabdabrahma Siddhanta* is presented here. *Brahma Jnana* or *Atma Jnana* is the basis of both *Vedanta* (a treatise on human consciousness and mental functions) and *Sabdabrahma Siddhanta* (A treatise on theory of language acquisition and communication).

4. THE MECHANICS OF MIND:

The following is a further interpretation and explanation of *being and becoming of mind* i.e., formation, structure and function of human consciousness, formation and retrieval of inner mental world and cognition-created experiences /senses/ moods participating in the cognitive processes and explanation of mechanism of sensing/ knowing/ learning/ expressing/ teaching/ thought process/ perception/ experience/ understanding and experience of meaningful experience and experienced meaning as expressed in the *Upanishads*. Human mind has four conscious states or phases, seven cognitive states and five kinds of functional states (Ramabrahmam 2006), (also see Concept Diagrams I to VI). They are:

Human consciousness creates conscious relationship between body functions and mental functions and also can dissolve such relationship. When such relationship is dissolved the right identification of ‘I’ happens. The real identification of ‘I’ provides the natural or normal or ground state of mind.

The natural or normal state of human mind is Unoccupied (mentally) Awareness; also termed as peace; bliss; silence. Mental functions form veil over this natural state and superimpose themselves on this pure consciousness as awareness and pure consciousness transforms into simultaneous existence of consciousness and awareness. The awareness creates self-consciousness also in the individual and then the individual relates oneself to the body, gender, social status, nationality, mental traits etc., and “*falsely*” identifies with all of them with an egoistic mind (Table I).

4.1. *Three kinds of awareness:*

Human consciousness is the source, guide and energy-provider for the human mind and its activities. Human mind possesses three kinds of awareness consecutively/simultaneously. They are: (i) *unoccupied awareness or pure consciousness* (ii) *awareness of within of the body* and (iii) *awareness of without of the body* (last two together is known as occupied awareness).

Human mind tunes itself to **without** of the body through sense organs and acts, reacts or interacts or communicates through action organs for cognitions and perceptions created by external stimuli from physical world outside the body. Information from external physical world is stored as inner mental world consisting of cognitions, perceptions and cognition-created or related experiences. All external

physical world is projection of individual's mind, with associated limitations and individuals deal with these mental projections some times in a biased way depending on individual's ability to know, perceive, reason, feel, intuit, understand and experience the reality.

Human mind tunes itself to the **within** of the body and senses aches, pains, inner mental world and also does intellectual operations. As described above inner mental world is made up of information known, sensed by sense organs and perceptions and experiences created by such cognitions and knowledge in the form of external stimuli. The same are retrieved by mind to create moods, intuitions in the form of verb, meaning, sense, understanding, insight, intuition, experience, urge, which become thoughts, perceptions and feelings in the form of sentences. The information about individual (self-consciousness with egoistic mind), the languages learnt together with meanings, senses of sounds (words) and utterances, forms of alphabet and objects of external physical world as words, sights, sounds, tastes, smells, touches and the perceptions and insight and understanding gained by the contemplation of perceptions, all form the inner mental world. All this knowledge acquired through sense organs in tune with mind can be termed as biophysical.

Instincts, urges and similar impulses created and guided by hormones and gland secretions-which also constitute the knowledge possessed by the individual organism can be termed biochemical - also inspire and stimulate mind to act, react and interact. Human mind is also capable of being in a state where and when all mental functions and cognitions cease to be or the mind transcends ongoing mental functions and effects of stimuli from external physical world and will be a mere witness to them as an uninvolved and unaffected spectator or seer. This state is the original state of human mind similar to zero in number system and vacuum in physical sciences [2-22]. Then the state of mind is pure consciousness or unoccupied awareness and exists as peace, bliss and silence. Thus human mind is sourced from human consciousness both materially, energy-wise and functionally. Human consciousness is always present. Human mind rises and sets depending on the phase or conscious state.

5. STATES OF MIND DURING HUMAN COGNITION AND COMMUNICATION:

5.1. Conscious states or Phases of mind (Ramabrahmam 2007):

Wakeful Sleep, deep sleep, wakeful or awakened and dream are the conscious states or phases of mind. Human consciousness is always on as conscious awareness – wakeful sleep and only mind rises or sets during these conscious states of mind causing

cognition and cognition-related experiences, storing and retrieving them and communications in respective phases (wakeful and dream). As already discussed human consciousness is the form, the structure and the consequence of breathing process and generates psychic energy that does all human cognitions and cognition- and communication-related functions. Cognition and cognition- and communication related functions are the result of reversible becoming of this psychic energy virtual reflection and human consciousness bifurcates as consciousness that is aware of the cognitions and communications, related activities and the occurrence of the activities themselves. When these activities are taking place, such a dual role is played by the human consciousness. There is also a phase when no cognitions or cognition-related activity is taking place and it is the original or normal or natural state of human mind, the non-dual or peaceful, blissful or silent phase of mind (wakeful sleep and deep sleep). (See also Concept diagrams I and II)

5.2. Cognitive States of mind (Ramabrahmam 2006):

Seven states of cognition are identified in relation to ego-transcending or egoistic or self-conscious state of mind. These cognition states function around the; 'I'-consciousness, 'I-sense, the I-thought or feeling and I-expression or utterance or in the absence of such identification. In the absence of individual-identification of 'I', no individual- specific information will be in the mental awareness and the mind transcends to a state or phase when the mental awareness becomes one with the consciousness and non-duality in the form of peace, bliss, or silence is experienced. Cognitions cease to take place but will take place if willed or necessary. The seven cognitive states of mind are:

Pure consciousness: Normal or original state of mind: "I" Consciousness – No "I" Awareness of and about individual

Meditative state of mind: Meditative state of mind. One pointed awareness.

Egoistic State of mind: "I" Awareness/Sense/mood- Ego Sense - State of verb/meaning/understanding/experience/intuition/urge- Infinite form or present continuous form of verb without subject or object attached.

'I' Thought/Feeling (awareness of within of the body)- State of sentence with subject-verb-object-perception

'I' Thought/Feeling (awareness of without of the body) in relation to outside physical world. Mind tuned to outside world through sense organs

"I" Utterance/Expression/also reception of stimuli from outside world and expression through action organs.

No "I" Awareness of or about individual- No Self consciousness or ongoing of mental functions. State of cessation of all types of mental functions.

5.3. *Kinds of functional states of mind (Ramabrahmam 2009a,b)*

- (a). Getting tuned to and sensing stimuli from external physical world through sense organs and reception.
- (b). Actions, reactions or interactions through action organs with external physical world activated by hormones or stored information.
- (c). Perception/thinking/reasoning/feeling in accordance with the stimuli from external world or information retrieved from inner mental world.
- (d). Conversion of above information into intelligible information as understanding or insight or experience
- (e). Awareness of
Understanding/intuition/urge/mood/experience/meaning/experience.

All this happens in the consciousness of Self or Atman or Brahman- the infrasonic mechanical oscillator forming and functioning as human consciousness.

Consciousness is non-dual (*advaita*) awareness. It is experience as bliss/peace/silence when self-consciousness is absorbed or got absorbed in pure consciousness. Consciousness is also experience when no cognitions or cognition-related experiences are in the awareness of mind. Experienced awareness is consciousness. Awareness of nothing within or without the body is consciousness. It is peace, bliss and silence. Mind is dual (*dvaita*) awareness. Knowing, perception, thinking, doing intellectual operations, discrimination, feelings, having moods, urges, intuitions, understanding, getting and having insight, experiences are functions of mind.

6. TYPES OF BRAIN WAVES AND THEIR CORRELATION WITH
CORRESPONDING CONSCIOUS STATES OF MIND AS PROPOSED BY
THE UPANISHADS:

At any instant brain neurons are generating millions of nerve impulses (action potentials). Taken together these electrical signals are called brain waves. Brain waves generated by neurons close to the brain surface, mainly neurons in the cerebral cortex, can be detected by sensors called electrodes placed on the forehead and scalp. A record of such waves is called an electroencephalogram or EEG. Electroencephalograms are useful both in studying normal brain functions, such as changes that occur during sleep, and in diagnosing a variety of brain disorders, such as epilepsy, tumors, trauma, hematomas, metabolic abnormalities, sites of trauma, and degenerative diseases. The EEG is also utilized to determine if "life" is present, that is, to establish or confirm that brain death has occurred.

6.1 Alpha Waves: These rhythmic waves occur at a frequency of about 8—13 Hz. One hertz is one cycle per second. Alpha waves are present in the EEGs of nearly all normal individuals when they are awake and resting with their eyes closed. These waves disappear entirely during sleep.

Jagrat Sushupti (wakeful sleep):

A series of 'I-I' pulses' issue out and virtual energy creation and transformation, when necessary, takes place. Mind is active if willed. Sense and action organs are alert and ready to function. Through meditation one reaches this state. State of Unoccupied awareness Purport Silence, Bliss, Peace, Pure Consciousness Divine consciousness, Real 'I' state etc. Normal, original, natural or ground state of mind. **State of Being of mind.**

6.2 Beta Waves: The frequency of these waves is between 14 and 30 HZ. Beta waves generally appear when the nervous system is active—that is, during periods of sensory input and mental activity.

Jagrat (wakeful):

Mind is active. Sense and Action organs are active are in working state. All knowing/expressions take place in this state. Meditation starts in this state. (awareness of without of the body). **Becoming of mind.** Excited and functional state of mind.

Swapna (dream):

Mind is active. Sense organs are in dormant state. Action organs will be functioning if necessary. Meditation becomes one-pointed in this state (awareness of within of the body). **Becoming of mind.** Excited and functional state of mind.

6.3 Theta Waves: These waves have frequencies of 4-7 HZ. Theta waves normally occur in children, and adults experiencing emotional stress. They also occur in many disorders of the brain.

6.4 Delta Waves: The frequency of these waves is 1-5 Hz. Delta waves occur during deep sleep in adults, but they are normal in awake infants. When produced by an awake adult they indicate brain damage.

Sushupti (deep sleep):

A series of 'I-I' pulses' issue out and mind is in absorbed state. No transformation of virtual mental energy reflection takes place. Sense and action organs are not in functional state. No awareness of within or without of the body-cognitions or remembrances-cognition related or created experiences or understanding or insight or intuition or urge. State of cessation of mental activities- **State of Being of mind**

The above classification of brain waves sensed by EEG informs that the frequency of the brain waves changes while mental activity is going on (beta waves). And during deep sleep the frequency is 1-5 Hz (delta waves) for adults (see also Concept Diagram I).

These observations are used to propose modulation /demodulation of infrasonic waves (brain waves) when knowing/learning/communication and all related or otherwise mental activities are taking place (Concept diagrams I to VI).

6.5 Kinds of human knowledge: Human knowledge is of two kinds: (i) acquired knowledge (through sense organs in tune with inner mental tools, which can be termed as biophysical and (ii) inherent or genetic knowledge and which is hormonal, which can be termed as biochemical (Ramabrahmam 2006). Especially the instincts, urges, sense (meaning/understanding/insight/intuition/experience) are inbuilt biochemically in the organism. Both kinds of knowledge are activated and used in all the phases, cognitive states and functional states of mind. Indian knowledge systems as described above also named mind with separate name for each of its functions-collectively as inner mental tools.

7. BRAIN WAVE MODULATION / DEMODULATION MODEL OF HUMAN COGNITION AND COMMUNICATION:

This rhythm was first sensed experimentally by (Adrian 1946) who made the first electrical recordings of the activity of individual nerve fibres. He discovered a universal law, for it would be impossible to understand the brain without this law: neurons communicate with each other by sending bursts of brief electrical pulses along their fibres. The pulses do not vary in size; but only in the frequency of their bursts, which can be up to a thousand impulses in a second.

Thus in the interplay of these conscious states the virtual mental energy reflection-pulse series - brain waves- having mechanical wave frequencies in the range of frequency 3 Hz -30 Hz, undergoes *frequency modulations* in the expresser/teacher and *frequency demodulations* consecutively in the receiver/knower/learner to give us knowledge, perceptions, experiences, understandings, meanings and skills in the simultaneous use of *Atman* (consciousness/awareness), *maya* (current of awareness flowing throughout the body), transformations of this virtual mental energy reflection as inner mental tools - electro-chemical branches –and mechanical energy branches, activating and using sense organs (CNS) and action organs (ANS). (See concept diagrams III to VI).

Thus human mental functions are the forward and backward transformations of the carrier cognitive-energy pulse series, *modulated* by energies sensed through sense organs or the stored information as potential energies retrieved (as *remembrances* – memory / experiences / understanding / meaning/ sense- first and then active inner mental world as feelings/thoughts/perceptions) and *demodulated* to give humans knowledge, experiences etc. The transformation and reverse transformation of virtual

mental energy reflection and its cessation of transformation – the dual- *dvaita* and non-dual- *advaita* conscious states respectively- taking place simultaneously, consecutively and alternately is the structure, form, function, state and essence of human consciousness, mental functions and cognitive processes. All this constitutes the *being and becoming of mind*.

Wakeful/Awakened, Dream (*Swapna*), Deep Sleep (*Sushupti*) and Wakeful Sleep (*Jagrat Sushupti*) - are different conscious states of mind creating different phases of mind. *They are structure and phases of mental Time-Space and time created by the presence of mental energy source and transformations associated with virtual mental energy reflection*. Mind functions or ceases to function in these phases of mind:

8. MEANS OF COGNITION, VALIDITY OF COGNITION AND COMMUNICATION:

- *Repeated perception gets recorded and creates and settles as and in memory.
- *Understanding gives insight.
- *Perception is correct / incorrect direction to understanding / misunderstanding.
- *Understanding and experience help mutually and are almost simultaneous and synonyms for same state of mind.
- *Understanding is experience and vice versa and they happen simultaneously.

Human beings know by the following means:

Means of cognition:

a) Through sense organs:

Eyes, ears, nose, tongue and skin, stimulated by light, sound, chemical, mechanical and thermal forms of energy respectively, are sense organs. Movements related to hands, legs, vocal chords, reproductive organ and bowels are action organs. .

Humans know/learn and express/teach in these conscious states of mind [2-8]. These conscious states or phases of mind are the result of transformation of psychic or mental energies in the *Unchanging and Ever-Present Consciousness/Awareness* present during all these conscious states as Energy-Presence. *Upanishadic* awareness calls such awareness as *Atman* or *Brahman* or *Prajnaanam*. *Atman* is normally referred to as Self. It is already informed above that *Atman* is present in us and is the result of the breathing process and is the Source of Mental-Energy. In modern scientific terms it is also *is* termed as a infrasonic bio-mechanical oscillator which issues out psychic or mental energy pulses of frequency 10 Hz [8]. Thus *Atman* is the oscillating (with infrasonic frequency of 10 Hz) psychic Energy-Presence denoting and providing Mental Consciousness/Awareness and Time-Space.

b) Through inference

Through the inner mental tools – manas, buddhi (discrimination and intellectual operations, ahamkaaram (formation and collection of thoughts/feelings about the individual in attention to body gender, mental traits, social status, and the like) and chittam (collects, receives, creates, stores, retrieves, recollects object-energy created experiences simultaneous to and in tune with knowing and perceiving – which includes the meanings, senses, understanding, insight, mood, intuition, urge, physical and psychological cravings etc.) Inner mental tools: registering and reproduction of information

Manas, Buddhi, Chittam and Ahamkaram are inner mental tools. Experiences created by perceived or retrieved object-energy forms are *remembrances and cognitions*-stored and retrieved collection of perceived object-energy forms is *inner mental world Jagrat Sushupti* (Wakeful Sleep) is *Unoccupied awareness*. Knowing/learning expression/teaching, thought, perception, experience, understanding, volition, urges etc., are *occupied awarenesses*, happening in *Jagrat* (wakeful) and *swapna* (dream) conscious states. *Sushupti* – State of cessation of mental activities.

c) By authenticity, authority or through faith, allegiance and obedience to earlier Expressions of eminent intellectuals; instincts/intuitions/impulses possessed by the organism through genes inherited.

8.2 Validity of cognition:

Consciousness provides the necessary mental awareness to cognize through these three means.

Pramaana = authority, reliability, means of cognition.

Pratyaksha = Direct – through sense organs- sensing- knowing- *vaikhari*.

Anumaana = Inference- through intellectual operations like logic, reasoning, induction, reduction, analysis, discrimination – perception- *madhyama*

Sabda = recollection (creation) of meaning- understanding- experience, intuition, state of verb, state of action (*kriya*)- *pasyanti*.

All the three *pramaanas* are having equal primacy and functioning consequentially in reversible way together they create and complete the cognition in reception and transmission. The *pramaanas* require earlier *pramaanas* and are consequences of one another in forward and reverse directions in completing and transmitting cognitions.

8.3. Means of communication:

The action organs movement of hands, movement of legs, movement of vocal chords (language), facial expressions through movement of eyes and head are of

communication the means of communication are in mechanical energy form.

Human mind has four modes: Three modes of awareness in continuous consciousness: Mode of knowing/expression. Mode of perception, sentence, logic, reasoning etc.,

Mode of insight, understanding, experience, mood, meaning, sense, intuition, instinct, urge, commonsense etc., Mode of consciousness sets in when awareness has become one with consciousness:

Fullness, bliss, peace, silence, meaningful experience or experienced meaning etc., In the mode of consciousness all the remaining modes take place sequentially and reversibly to make one knowledgeable and communicate the acquired or inherent knowledge. Mode of insight is the result of perception or intuition or instinct. State of insight is permanent once understanding sets in or experience takes place compared to state of perception.

Knowing is the result of direct sensing by sense organs. Perception is correlation of sensed information with already known and preserved information stored in inner mental world. So is understanding or experience. Insight is the fruit of understanding. Intuition is a flash arising from insight or experience. The intuition flashes as an action to be performed in the form of verb (sense). Understanding is also thus a correlation of perception with already available senses or experiences or insight within created by earlier perceptions or sense or instinct naturally

9. HARDWARE OF HUMAN MENTAL FUNCTIONS ACCORDING TO *UPANISHADIC* INSIGHT:

Sense organs receive information from the external physical world through respective object-energy forms which they can sense. When an object energy-form is thus sensed through sense organs and *inner mental tools*, this verb state becomes a state of sentence – *feeling* or thought. This state is known as *madhyama* mode of language -the state of sentence or thought and is the modulated form of virtual mental energy reflection. This modulated energy- form gets transformed into sound energy through vocal chords' movement and is expressed /uttered. This is the *vaikhari* mode of language. All this happens in the speaker/teacher.

This uttered sound-energy (the *vaikhari* mode of language) is picked up by the ears (sense organs) of the listener/learner and becomes sentence in the *madhyama* mode- the modulated *virtual mental energy form* mode in conjugation with the inner mental tools. This sentence-energy form in *madhyama* mode is in *subject-verb-object* (the triad-*triputi*) form. This mode of language gets demodulated (reverse transformation of *maya* - *the becoming* in the reverse direction) into meaning, resulting in understanding/experience

in the *pasyanti* mode- to a verb (sense), in present continuous or infinite form, the subject and object being dissolved in the sense of uttered /expressed sound.. This, when meaningfully experienced in the awareness of *para* mode, is the purport or import of the uttered word- Bliss, Being, Peace or Unoccupied Awareness , the normal or natural state of mind - *i.e.*, the state of Self, *Atman* or *Brahman*.

Thus *psychic* energy (virtual mental energy reflection) pulses, being issued out by *Atman* [*Sat-Chit-Ananda* (Being-Pure Consciousness-Bliss)] and after getting reflected in the *medha*, (can be *medulla oblongata* or *reticular formation*?) as virtual or *chit*- energy (virtual mental energy reflection) pulses , first get modulated from this *para* / *rasa* / *purport* mode by cognizing stored energies in potential (*jada*) form—in the form of subject-object- free verbs/senses, experiences, intuitions, understandings, urges , volitions through the inner mental tool *chittam* to be transformed in to the mode of verb, mood, experience-*pasyanti*; then again gets transformed into sentence -subject-verb-object state, the *madhyama* mode - by simultaneously cognizing the object energy-forms – stored as potential energy (*jada*) forms – as inner mental world through the inner mental tool, *manas* in the awareness of within -- as feelings or thoughts. Intellectual operations such as reasoning, decision making, take place in this awareness. When the inner mental tool, *manas* is tuned to the object energy-forms (light-eye, sound-ear, chemical- tongue, nose and heat, mechanical-skin) through–sense organs- then the awareness becomes -awareness of without. This process (in expresser/teacher and the reverse of this process, (demodulation in listener/knower/learner) happen in human-beings while expressing/speaking or listening/learning- as transformation or reverse transformation respectively-together known as reversible becoming- of *maya* and inner mental tools in conjugation with sense organs and action organs.Further the inner mental tool *buddhi* takes care of intellectual operations and other mental tool, *ahamkaram* takes care of self-consciousness. Both *buddhi* and *ahamkaram* are electro-chemical forms of mental energy reflection *maya*.

Simply put, according to *Upanishads*, human mental functions are the forward and backward transformations of *chidabhasa* or *maya* or *pranavam* - the carrier (in the sense of carrier radio wave in broadcasting and reception process) cognitive-energy pulse series, **modulated** by energies sensed through sense organs or the stored information as potential energies retrieved (as *vasanas* - object-experiences, which include meanings of utterances, first and then *jagat*[retrieved inner world by antahakaranas - *manas*, *buddhi*, *ahamkaaram*, *chittam*]) as feelings/thoughts/perceptions) and **demodulated** to give humans knowledge, experiences etc. The transformation of *maya*, reverse transformation of *maya* and cessation of transformation of *maya* - the *dvaita* and *advaita* conscious states respectively- taking place simultaneously, consecutively and alternately

is the structure, form, function, state and essence of human consciousness, mental functions and cognitive processes (see also Concept Diagrams III A and III B). Most of present attempts aim at modeling machine cognition as an isolated process which is the result of sensing (19). But if human mental processes are observed, it becomes obvious that human perception is but an intermediary process which transfers sensing into sense (understanding/experience) and sense into expression. Human cognitive process can be stated sequentially as follows: (1) *sensing*: through sense organs (knowing), (2) *perception* (thinking, reasoning, decision making, etc.), (3) *understanding/experience*, (4) *purport*- meaningful experience or experienced meaning. Human mental process is generally held to be a combination and quick successive transformations of four modes i.e.,

I Speaker/Teacher: (a) Purport/Awareness (Meaningful Experience or Experienced Meaning) (b) Understanding/Experience (c) Perception/Thinking (d) Utterance /Expression

II Knower/Listener/Learner: (a) Knowing (through sense organs) (b) Perception/Thinking (c) Understanding/Experience (d) Purport (Meaningful Experience/Experienced Meaning)/Awareness.

9.2. *The gist of above proposition:*

1. Human consciousness is an energy-presence in the form of bio-oscillator/maser/laser issuing out mental energy pulses.
2. Human consciousness is a series of awareness responsible for and constituted by mental energy pulses generated by breathing process and the consequent gaseous exchange taking place in the lungs.
3. The time period of one mental energy pulse is 10^{-1} sec.
4. Human consciousness as oscillating energy-presence is the provider of mental energy, mental time space and awareness.
5. Human consciousness is an awareness of both mental activities and their cessation.
6. Modulation and demodulation – the forward and reverse becoming - of virtual mental energy carrier pulse series *maya* in two stages is the process of all human sensing/ learning/ knowing/ expressing/ teaching/ perceiving/ doing intellectual operations/ thinking/ understanding/ experiencing associated with human acquiring and imparting knowledge through languages or otherwise about the disciplines and skills (painting, singing, dancing, car-driving etc.,) and the ability to perform those skills.
7. Human consciousness is the result of breathing process and is an oscillating energy presence. Energy released from such an energy presence and its flow is the *current of awareness* flowing throughout the body and makes the body active cognitively by

activating neurons, proteins-the biochemical hardware -- similar to *electric current* flowing throughout a television set makes it active in conjunction with hardware within and apparatus that sense, receive and reproduce the information.

10. SOFTWARE OF MIND AND VALIDITY OF KNOWLEDGE:

Through sense organs: *Pratyaksha pramana*

Sense organs: receiving information from outside physical world

Knowing takes place through the medium of inner mental tool – manas– through inference: *Anumaana pramana* - using discretion, induction, deduction, analysis, etc., by authenticity, authority or through faith, allegiance and obedience to earlier expressions of eminent intellectuals: *Sabda (aagama) pramana*

Completely based on faith the individual has for experts in the field, instinct, earlier knowledge brought down through generations through books. etc.,

10.1. Axioms for the process of human Cognition and Communication:

The cognition- knowing, perception, storing, re-cognition, retrieval and communication are facilitated by the psychic energy released by breathing process and its transformation and transductions in forward and reverse directions.

The transformation in forward and reverse direction of reflected psychic or mental energy gives rise to *dvaita* state of mind when consciousness becomes seer + awareness and splits into triad as knower – knowing – known; subject – verb – object; cognizer – cognizing – cognized; communicator – communicating – communicated during cognition and communication of humans.

When this transformation and reverse transformation cease to take place then the state of mind is known as *advaita* state, when knower and known merges into knowing; subject and object merges into verb, cognizer and cognized into cognizing, communicator and communicated starts as communication.

Sense organs: receiving information

Inner mental tools: registering and reproduction of information

Action organs: reaction and responding to information/communication.

Cognition is a series of cognition, re-cognition and communication and de-cognition and de-communication.

Cognition and communication – Listener and Expresser:

Cognition consists of cognizing elements, cognizing tools, cognizing agent, cognizing process, cognized elements: Knowing – perceiving – experiencing / Understanding/ Becoming the Sense and being the essence / fruit / purport / import / rasa / culminating as peace / bliss / silence (No – cognition state but is the result of

experience of the essence of the cognition) – in the listener and just the reverse process in the expresser forming and resulting in the communication.

Thus cognition has three stages of knowing, perceiving and experiencing and all these three under the observation of the Consciousness as acts as Seer / Witness untouched by these mental happenings during the whole process of cognition, re-cognition and communication.

There is also a state or stage of no-cognition taking place, then the consciousness is pure known as pure consciousness, signifying content-free contented state, cognition and related experiences-free unoccupied awareness – experienced as bliss, peace silence, mental quietude, anxiety-, fear-, worry-, doubt-free mental state.

Action organs communicate and express the already mentally stored, recollected, re-cognized experience, perception.

It is not the question of whether an object is there or not in physical world around. It is whether the object is cognized or not. When *chit* energy lights the object, the object is cognized. If the light is off object is not cognized.

When not cognized for the lack or absence of *chit* energy it is as good as the object is not present for the cognizing agent. Lighting of object world (outside the body or perceived within the body from earlier already created mental impressions) is cognition by *chit* energy. The object is present as stimuli-causing in the outside physical world and as potential energy form inside the body as perceived world or between *chit* energy or object-energy form (live, dynamic, current). Lighting by *chit* energy means presence of mind to be able to do all forms mental functions. Absence of mind is deep sleep or wakeful sleep conscious state.

Cognition of objects is temporary. *Atman* is the constituent cause (*samavaayikaarana*). And contact of *atman* with *manas* is the auxiliary cause (*asamavayeikarana*).

The Self brings about cognitions when it is contact with *manas*.

10.2. *The Formation and Structure of cognition and communication: Concept and idea of Triad (Triputi):*

The Triad:

The cognition- knowing, perception, storing, re-cognition, retrieval and communication are facilitated by the psychic energy released by breathing process and its transformation and transductions in forward and reverse directions.

The transformation in forward and reverse direction of reflected psychic or mental energy gives rise to *dvaita* state of mind when consciousness becomes seer + awareness and splits into triad as knower – knowing – known; subject – verb – object; cognizer – cognizing – cognized; communicator – communicating – communicated

during cognition and communication of humans.

When this transformation and reverse transformation cease to take place then the state of mind is known as *advaita* state, when knower and known merges into knowing; subject and object merges into verb, cognizer and cognized into cognizing, communicator and communicated starts as communication. Thus the cognition consists of:

10.3. Structure of Cognition:

Cognizing element/agent/subject Instruments of cognition object of cognition
(impersonal)

Dvaita phase of mind:

Conscious states of phases of mind when mind alternates between *dvaita* and *advaita* states during wakeful and dream conscious state of mind

Mental states of cognition: *Advaita*, *dvaita* and their simultaneous existence and working

Types of cognition: Knowing, perception, experience / mood/sense/ meaning/ understanding/ insight/intuition/ urge, craving:

Stages of cognition:

States of cognition:

Functional – form – construction – structure – plane – level of cognition

Elements of cognition: Object energy forms (sense organs / knowing), electro-chemical (inner mental tools / perception / logic / intellectual operations /) and biochemical [experience / sense / mood etc., (inner mental tool *chittam*)] under the observation of infrasonic oscillator – the consciousness.

Forms of energies being sensed during knowing: light (eye); sound (ear); chemical (tongue - taste / nose – smell) mechanical (skin – touch) heat (skin - cold, cool, warm, hot).

Form of energy facilitating perception and other intellectual operations, sentence formations: electro-chemical.

Form of energy facilitating experience etc., : biochemical

The perception (electro-chemical) and experience (biochemical) are carried by and as the frequency modulations/demodulations of the infrasonic pulse series – the reflected mental energy pulses – the brain waves – generated by and are the result of rhythmic breathing process.

The *guna* concept of cognition: in the sense of mental tie up (*guna* means knot too). The word *guna* extensively used in Indian spiritual texts, means mental tie-up. If the mental tie-up is with object-energy form through the means of manas, it is *tamoguna*;

bahirmukhadristi; antarmukha dristi too..

If the mental tie-up is with inner mental world –with stored collection of information about outer physical and / or impressions created by such information it is *rajoguna. Antarmukha dristi. / awareness of within.*

If the mental tie-up is with experience, mood, meaning, sense, insight, understanding, intuition, urge, volition, through inner mental tool *chittam*, it is *sattvaguna. Antarmukha dristi / awareness of within (awareness of without and within).*

Prapancham (inner mental world) is created as potential energy in the respect cortices and when this is retrieved, it is called *jagat (moving)*, the dynamical form of information as thought, feeling, perception preceded by experience, mood, sense etc., differentiated and split as knower-knowing-known or subject-verb-object, the triad, in the *dvaita* phase of mind i.e, the *jaagrat* (wakeful) and *swapna* (dream) conscious states of mind.

10.4. Instruments of Communication:

Inner mental tools: retrieval and reproduction of information through action organs

Action organs: reaction and responding to information.

10.5. Human Mind: Its phases, cognitive states, functional states and functioning:

Human mind has four modes:

Three modes of awareness in continuous consciousness:

Mode of knowing/expression

Mode of perception, sentence, logic, reasoning etc.,

Mode of insight, understanding, experience, mood, meaning, sense, intuition, instinct, urge, commonsense etc.,

Mode of consciousness sets in when awareness has become one with consciousness:

Fullness, bliss, peace, silence, meaningful experience or experienced meaning etc.,

In the mode of consciousness all the remaining modes take place sequentially and reversibly to make one knowledgeable and communicate the acquired or inherent knowledge.

Mode of insight is the result of perception or intuition or instinct. State of insight is permanent once understanding sets in or experience takes place compared to state of perception.

Knowing is the result of direct sensing by sense organs. Perception is correlation of sensed information with already known and preserved information stored in inner

mental world. So is understanding or experience. Insight is the fruit of understanding. Intuition is a flash arising from insight or experience. The intuition flashes as an action to be performed in the form of verb (sense). Understanding is also thus a correlation of perception with already available senses or experiences or insight within created by earlier perceptions or sense or instinct naturally possessed by the organism through genes inherited.

II. FORMS OF ENERGY AND THEIR TRANSFORMATION DURING HUMAN COGNITION AND COMMUNICATION:

The concepts developed above using *Upanishadic* insight regarding human consciousness, mind and mental processes and their applications in information acquisition and transmission by, through and in human body can be used to model human cognitive processes. A sequential reversible process by the stepwise transformation of (i) infrasonic form of energy and transformation of information already stored in (ii) biochemical form within as memory, and retrieved as inner mental world into (iii) electrochemical and then into (iv) mechanical form while communicating and the reverse of it as the (i) input stimuli from outside world as light, sound, chemical, mechanical and heat forms, into (ii) electrochemical, (iii) biochemical and finally into (iv) infra sonic form while acquiring and understanding processes take place. Comparison is made between energy transformations in electronics communication processes and these psychic energy transformations that give rise to cognitive processes. This comparison gives an insight and theory of origin, structure, function and cessation of human mental functions. A comparative diagram that describes application of infrasonic energy transformations associated with bionics as biochemical, electrochemical and mechanical forms is also given.

For pure consciousness: the objects of cognition and communication are: experience etc., biochemical forms / perception, the electrochemical form /sensing through sense organs through the medium of *manas* and expression or communication through action organs as mechanical energy forms - which happen through the medium of infrasonic mental energy pulse series - modulation and demodulation-respectively for communication and cognition and are manifested and reflected by and of brain wave transformations.

The comprehensive nature of information and understanding as available above in the Upanishads in relation to the scheme of human cognition and communication is presented. All this is highlighted with vivid classification by differentiating cognition as a combination of cognitive agent, cognizing element, cognized element; formation, form and structure of cognition, instruments and means of cognition, validity of

cognition and the nature of energy/matter which facilitates and is the medium of cognition- cognizing process. The human communication process which is the reverse of cognizing process is also presented with necessary description.

The sameness of cognitive and communicative process during language acquisition and communication processes is also given. In fine the hardware and software of human cognition and communication as envisaged in Indian philosophical thought are presented.

12. CONCLUSIONS:

1. Human consciousness is awareness of human mind.
2. Human consciousness is the result of the breathing process and the consequent rhythmic gaseous exchange in the lungs and is an oscillating energy-presence in the form of a bio-oscillator / maser /laser/paser issuing out mental energy pulses of frequency 10 Hz.
3. Human consciousness is **not** a term denoting any of an individual, individual's body, self-consciousness, the social status, age, gender etc.,
4. Human consciousness is the **unoccupied awareness** in the individual in the *Jagrat* *Sushupti* (wakeful sleep) consciousness state when peace, bliss, silence and oneness or non-duality is experienced.
5. Human consciousness is not a person, a thought, a sense, an experience or an understanding. It is a **consciousness** which transcends all these and is a non-transforming **seer** and **witness** to all these and is revealed and experienced as peace or bliss or silence in wakeful sleep conscious state- the mind-transcending phase when all mental activities in the form of thoughts and senses etc, -cease to be. And one has to refer to this natural and normal mental state when one refers to human consciousness.
6. Human consciousness is unceasing, undivided continuous blissful awareness.
7. Human consciousness is a consciousness present always and is super-imposed but untouched by mental functions during wakeful (*Jagrat*) and dream (*Swapna*) conscious states and becomes sense/mood or thought or expression. Self-consciousness arises in these two states and then 'I' is identified with individual's body, sense and thoughts about I, me, mine, mental capabilities, gender, social status, age etc, and masks pure consciousness /. In deep sleep (*Sushupti*) conscious state (like zero in number system without value but is essential and significant) there is no awareness of the body, the within or without of the body. No 'I' expression, thought, feeling or sense or experience relating to individual exists in this mental phase.
8. Human consciousness is an eternal consciousness transcending the three conscious states – wakeful, dream and deep sleep- and observes all the mental activities or cessation of such activities taking place in these three mental phases. It is also present

during these phases as continuous consciousness/awareness to happenings within and without of the body.

9. Human consciousness sources the mental energy and mental time-space necessary for the origin, form, structure, function and cessation of human mind and its activities.

10. Human consciousness is divided into four consciousness states of mind. They are Wakeful Sleep (*jagrat sushupti*), Deep Sleep (*sushupti*), Wakeful (*jagrat*) and Dream (*swapna*) providing unoccupied awareness, awareness of without of the body and awareness of within of the body respectively giving *advaita* and *dvaita* conscious states of mind.

11. Human mind is a combined operation of human consciousness (Self-*Atman*) and transformations of its reflected and virtual mental energy reflection *maya* or *pravanam* - comprising of modulations and demodulations to it-constituting inner mental tools associating closely with, stimulating and receiving stimuli from sense organs and action organs.

12. Human mind is the manifestation and functional form of human consciousness. It is a tool for human cognition and communication, intellectual operations, storing and retrieval of human experiences/understanding/sense (meaning of an utterance/expression) and relates the individual to the body, personality traits and social status. Human consciousness both observes and transcends all these.

13. Human cognition takes place in the simultaneous play of *dvaita* and *advaita* states of human mind. In *dvaita* state a differentiated perception of *knower-knowing-known* is experienced. In the *advaita* state the sense/understanding/meaning of utterance/expression becomes cognition element to consciousness and the knower and known dissolve into knowing. Only consciousness is present in the *advaita* state. Consciousness is split into consciousness and awareness in the *dvaita* state.

14. Human language learning/understanding and communication processes happen in the interplay of *Bhakti (advaita)* and *vibhakti (dvaita)* states of mind.

15. Human knowing and communication process is a quick successive transformation of four modes of cognition/language. The modes are:

I. Speaker/Teacher: communication:

(a) **Infrasonics:** Pure Consciousness/Purport/Unoccupied Awareness (Meaningful Experience or Experienced Meaning-*para*) *Bhakti* : experience of import *Infrasonics*

(b) **Biochemical:** Understanding/ Experience/ Sense/ Mood/Volition/ Intuition (*pasyanti*) state of verb

(c) **Electrochemical:** Perception/Thinking/Feeling (*madhyama*) *vibhakti* : state of subject-verb-object

(d) **Mechanical:** Utterance /Expression (*vaikhari*) *vibhakti* state of subject-verb-object in audible form

II. Knower/ Listener/ Learner: knowing/ learning, cognition and understanding:

- (a) Mechanical/and other energy forms' stimuli: Knowing (through sense organs)-
vaikhari
(b) Electrochemical: Perception/Thinking - *madhyama*
(c) Biochemical: Understanding/ Experience/Sense/mood/Volition/Intuition -
pasyanti
(d) Infrasonics: Pure Consciousness/Purport (Meaningful Experience/ Experienced
Meaning)/Unoccupied Awareness- para.

16. Human cognition and communication is the result of modulations and demodulations relating to mental energy pulse series similar to the modulation and demodulation happening to carrier radio wave during transmission and reception of radio and television broadcast and telecast.

GIST OF ABOVE PRESENTATION: PICTORIAL DIAGRAM OF HUMAN COGNITION AND COMMUNICATION PROCESSES- A COGNITIVE SCIENCE INSIGHT

A: Upanishadic and Sabdabrahma Siddhanta insight:

Consciousness (Being-Sat)
idam)

Awareness (Becoming-

Speaker: Modulation-*purodhana* →

Brahman/Atman chidaabhaasa/maya/pranavamantahkarananikarmendreyani / jnaanendrayani

Import experience/understanding/insight feeling/thought/perception
actions/reactions/cognitions

← *Vivartanam-Reversible Becoming* →

Bhakti sphota+iccha/arthasaktivibhakti/ jnnanasaktiucchaarana/kriyasakti

Para/tatpara/Tatparya pasyanti madhyama
vaikhari

Purport mood/ urge/sense/ verb sentence/ subject-verb-object sentence in
sound form

← *tirodhana-*
Demodulation : Listener

Human consciousness is expressed by the term 'I'. The real identity of 'I' is Unoccupied Awareness. 'I' is the psychic **energy presence** as an oscillator issuing out psychic energy pulses which are **transformed/modulated/demodulated** to enable the individual to know (through sense organs), act, react, interact (through action organs), perceive, do intellectual operations (like reasoning, logic, etc.), experience, understand, intuit, feel and express, urge, sense and express generated volitions and all mental functions related to knowing/learning, expressing/teaching enabling human-beings to know, learn, express, teach various disciplines, languages, acts, skills etc.,

2. *Tat Tvam Asi* YOU ARE THAT

Self-consciousness (ego) is part of human consciousness and relates to individual's senses and thoughts regarding one's body and its features, gender, mental traits, status in society etc.,. Pure consciousness is original and natural state of human consciousness when the individual is bereft of self-consciousness in the mental awareness and is termed as mental solitude or Silence. Peace, Bliss, Calmness- Thought and sense transcendence are its characteristics. Pure consciousness is **forgetting or being unaware of** self-consciousness. Self and Pure Consciousnesses are same in nature, content, structure, form (function) and presence. At a given moment either self-consciousness or pure consciousness will be present. Self-consciousness is super imposition over pure consciousness. Pure consciousness is continuous, self-consciousness is transient and transitory.

3. *Ayam Atma Brahma* THIS ATMAN IS BRAHMAN

Atman is *Brahman* – Unoccupied Awareness – Energy Presence without transformation.

4. *Prajnanam Brahma* PRAJNANAM IS BRAHMAN

Brahman– as *Atman* – Energy Presence – is Mental Time- Space and Continuous Awareness. *Prajnanam* is Unoccupied (by cognitions, thoughts, cognition-related and created experiences, senses or their retrieval) Awareness in Pure Consciousness.

5. *Raso vy Saha* AWARENESS OF MEANINGFUL EXPERIENCE AND EXPERIENCED MEANING IS BRAHMAN

Experience of Essence of the meanings of all *vakyas* (sentences), the cognition-related experiences in the awareness of the *Atman*. Meaningful Experience. Silence. Peace. Bliss. Experienced Meaning. Purport.

6. *Anando Brahma* BLISS IS BRAHMAN

Unoccupied Awareness is Bliss.

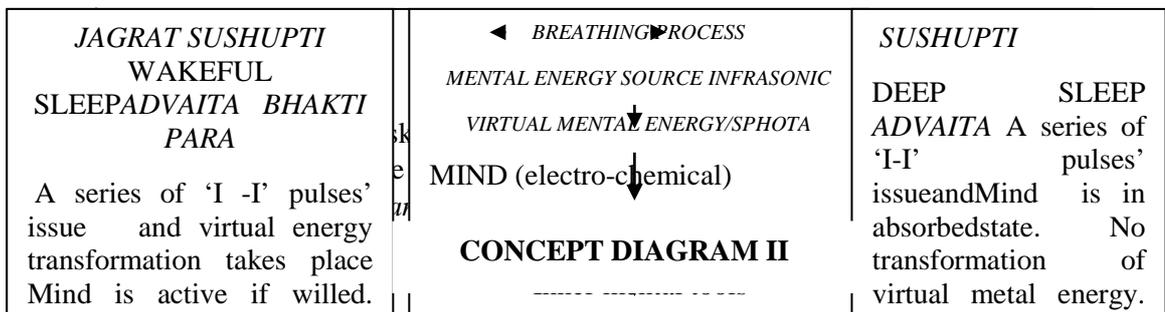
7. *Sarvam Khalu Idam Brahma* ALL IDAM IS BRAHMAN

All the world -*idam*, *prapancham* or *jagat* (collection of cognitions sensed by sense organs through the medium of *manas*) – is composed in, made up of, sustained by, rests in and ceases to be because of and part and parcel of psychic energy pulse generator – *Atman*.

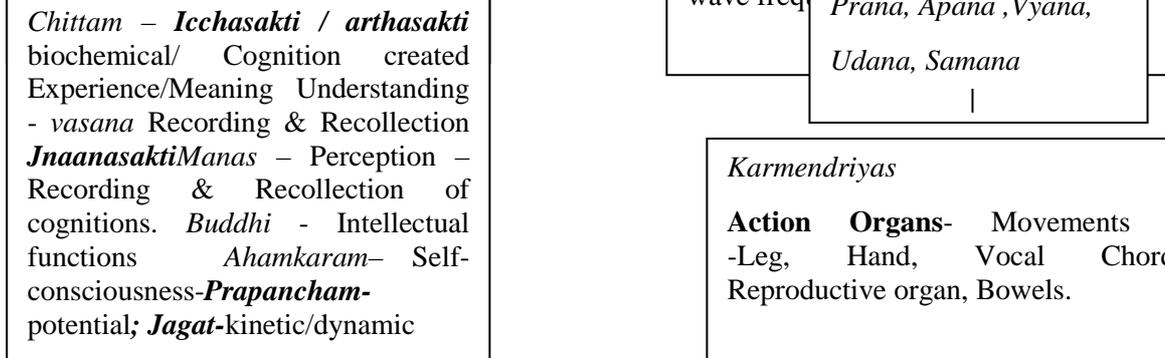
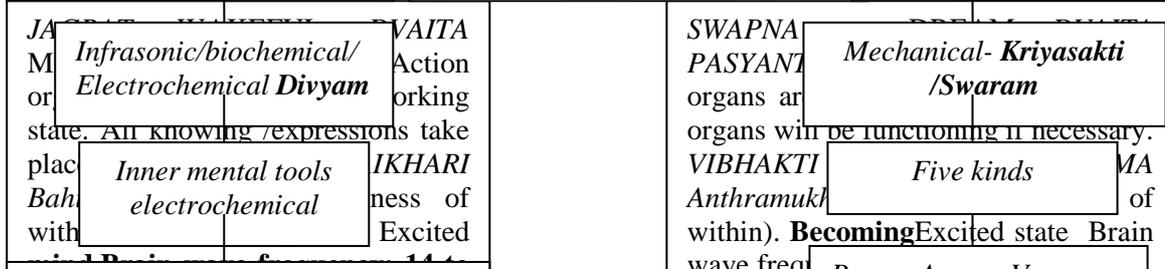
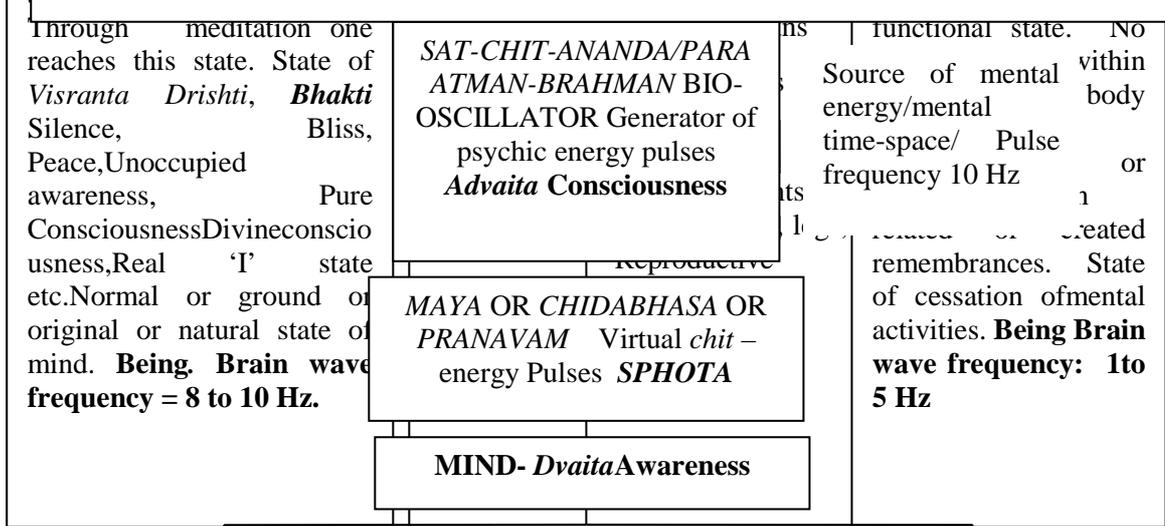
CONCEPT DIAGRAM I

STATES OF CONSCIOUSNESS – MENTAL TIME – SPACE

PHASES OF MIND



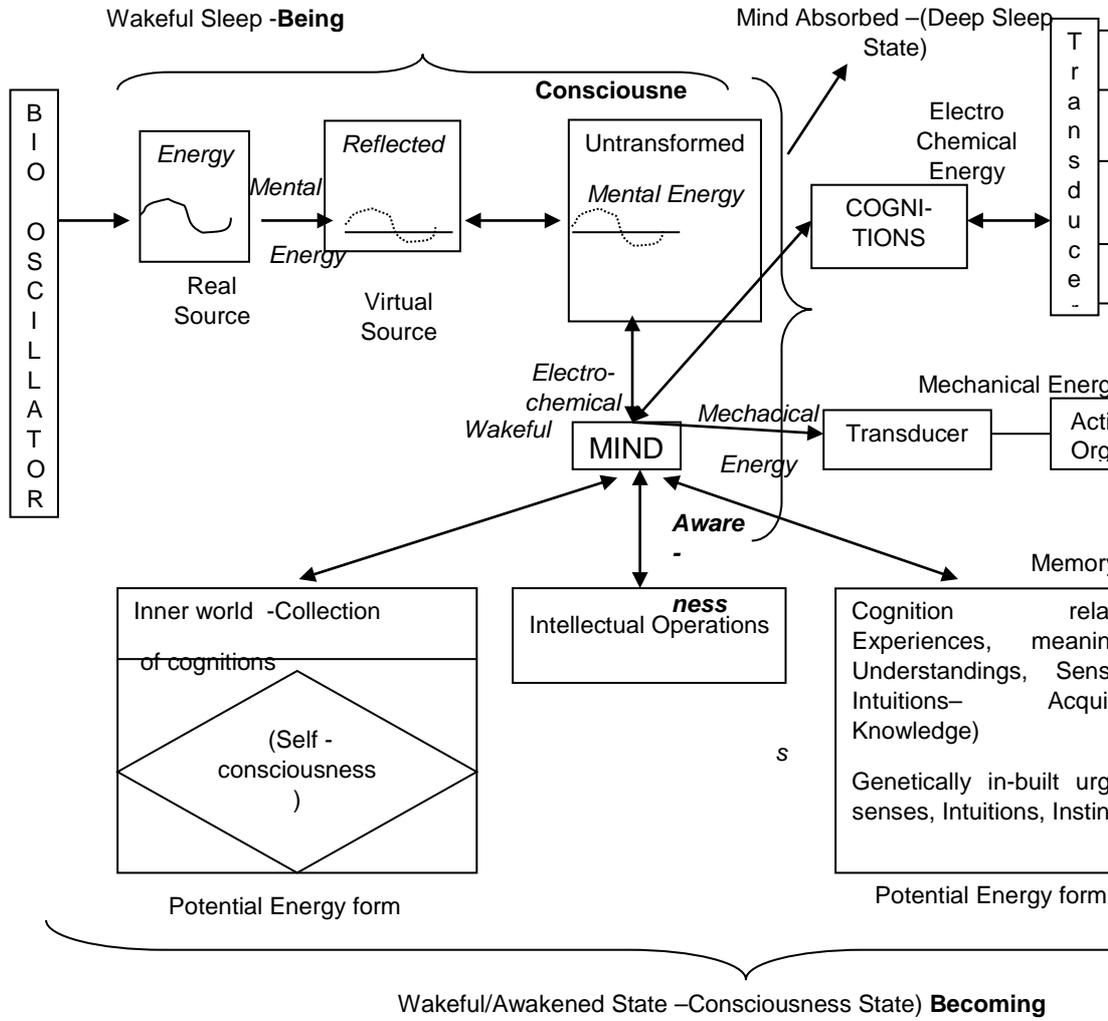
ARCHITECTURE OF MIND ACCORDING TO SABDABRAHMA



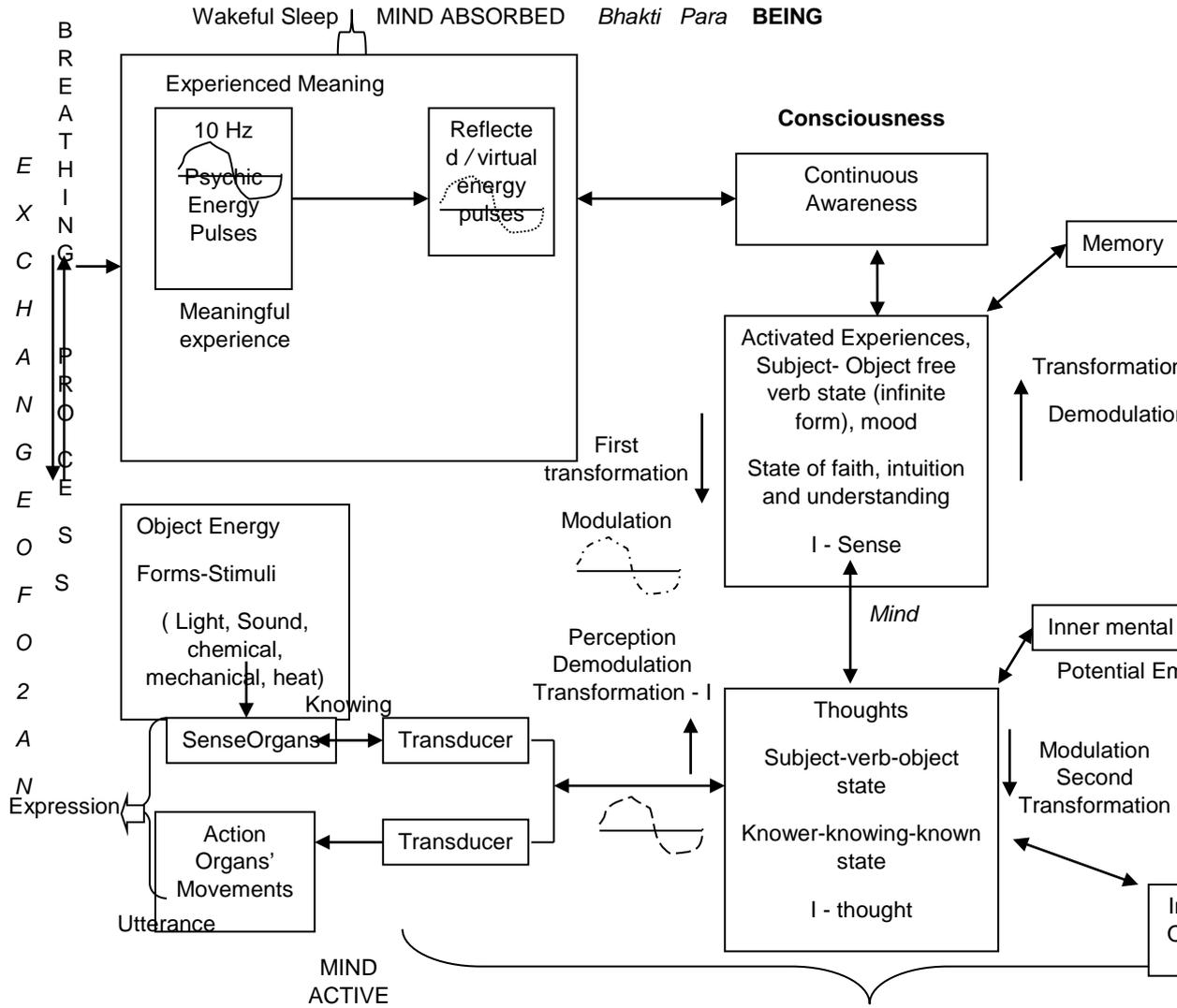
BREATHING
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CONCEPT DIAGRAM III A

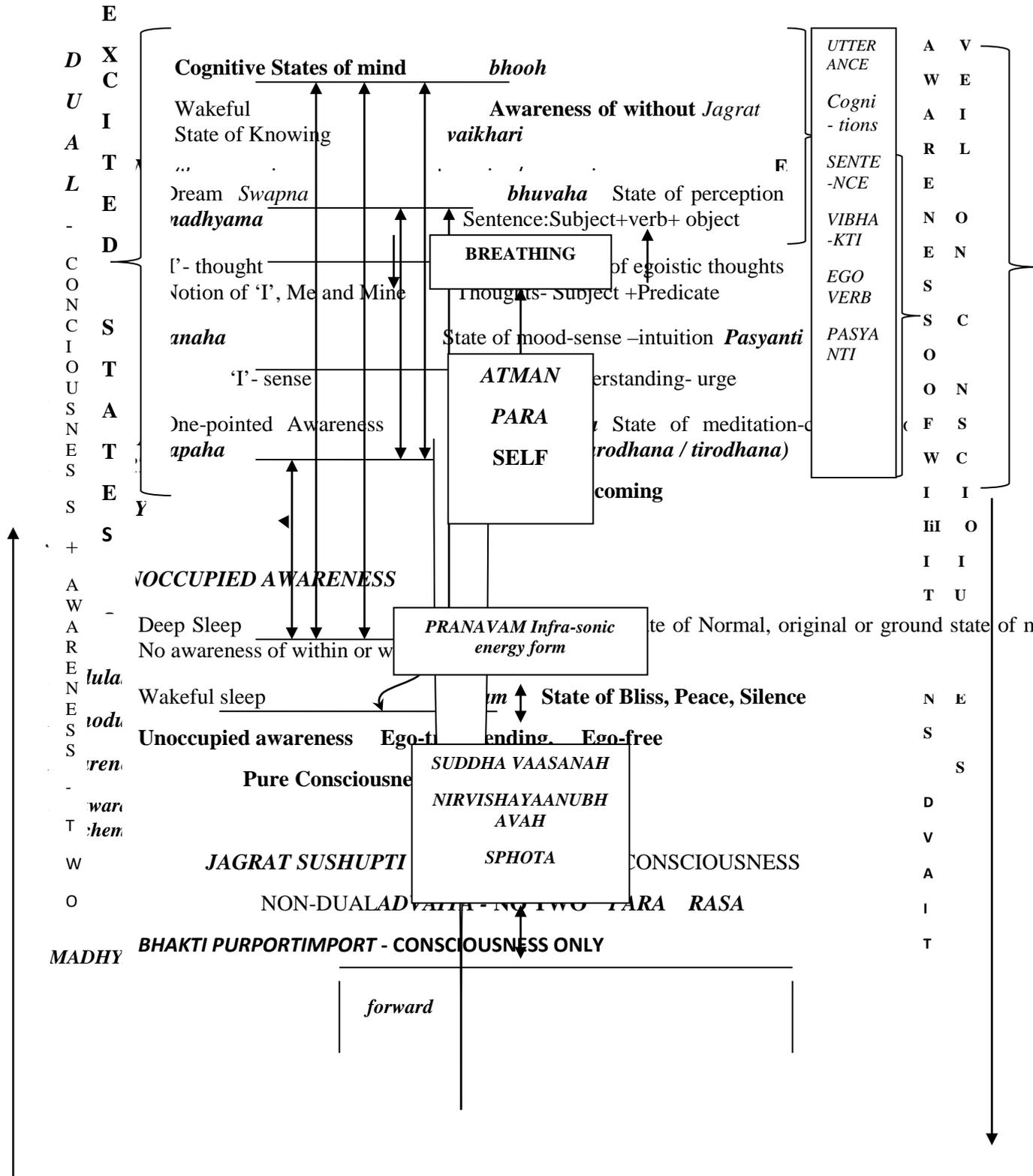
FUNCTION OF MIND

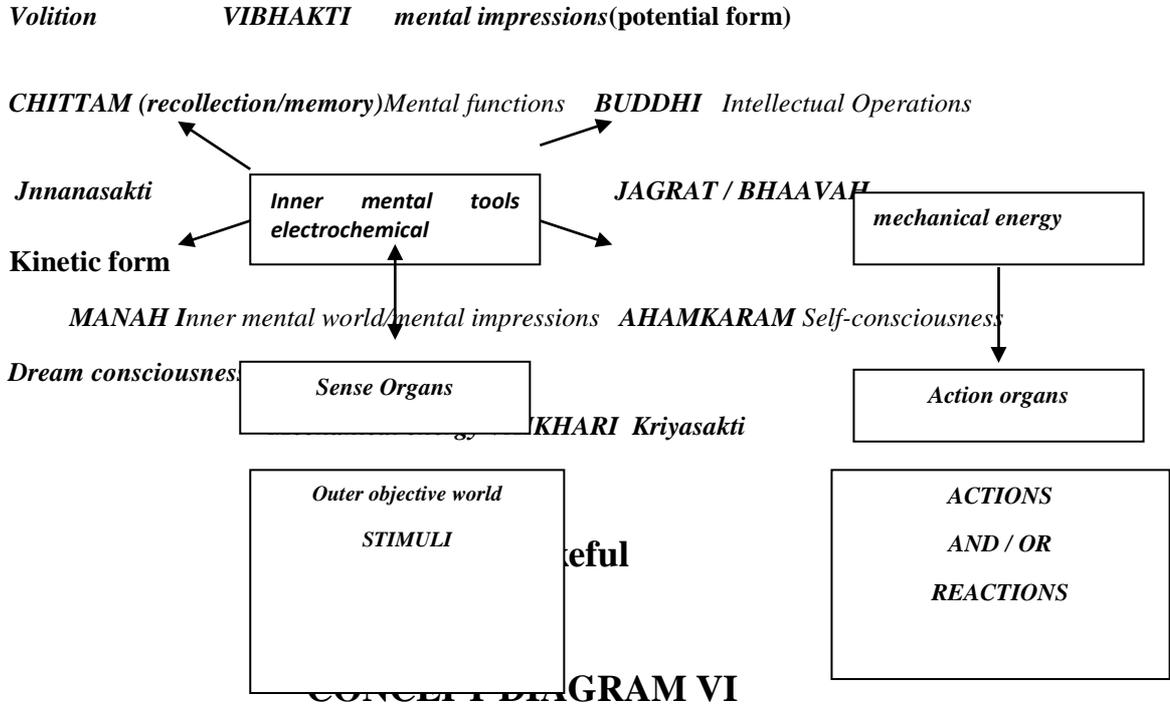


Concept Diagram III B – ELECTRONICS/BIONICS OF KNOWING/LEARNING

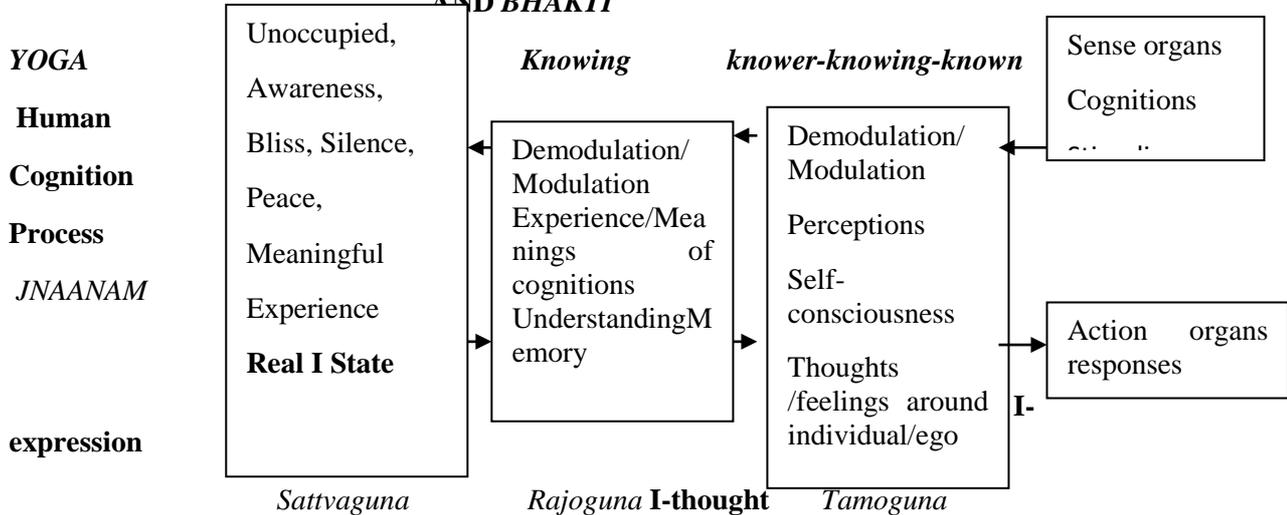


CONCEPT DIAGRAM IV: STRUCTURE AND COGNITIVE STATES OF MIND





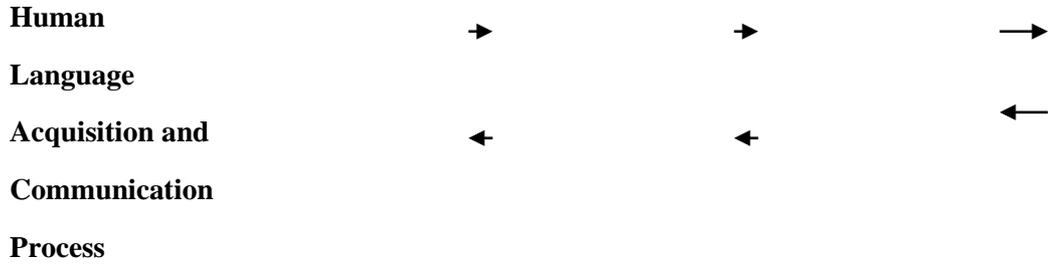
COMPARISON OF HUMAN COGNITION AND LANGUAGE ACQUISITION AND COMMUNICATION PROCESSES – YOGA, JNAANAM AND BHAKTI



SPHOTA + VERB VIBHAKTI (SPHOTA AS SENTENCE)

MAUNAM / BHAKTI / RASA

Experienced Meaning Purport <i>Rasa</i> <i>Tatpara</i> <i>Para</i> <i>Tatpariya</i>	Verb in infinite or present continuous form without subject and object-senses / meanings <i>Pasyanthi</i> KARANA	Verb with subject and object in respective tense Sentence <i>Madhyama</i> SUKSHMA	Utterance Movement of vocal chords hearing Ear <i>Vaikhari</i> STHULA
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Pranavam/sphota + *Icchasakti/Arthasakti* + *Jnaasakti* + *Kriyasakti*

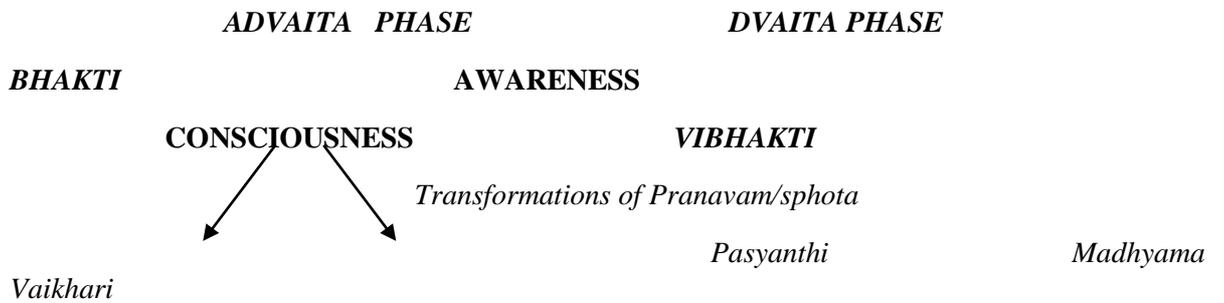
Volition /Urge	knowing	Expression
Intuition/insight /understanding	perception	Action
Mood/Sense/ Experience/meaning Reaction		logic/reasoning

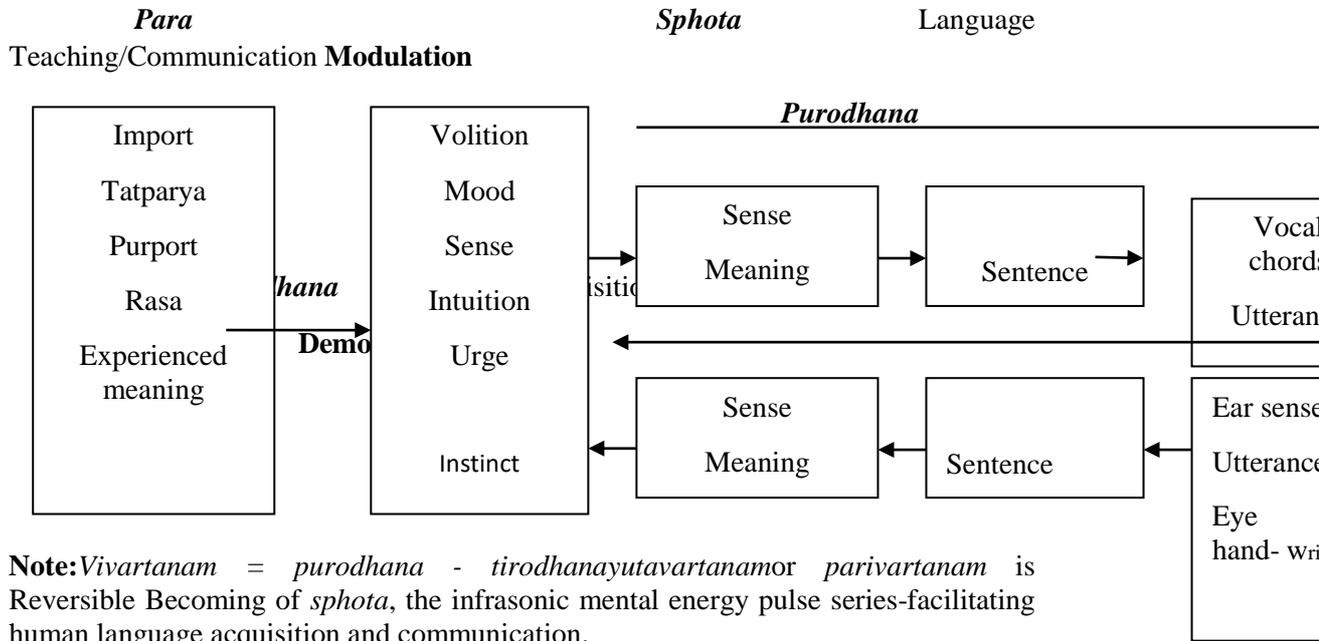
Biochemical/Genetic/ Inherent /HORMONAL **Biophysical**

Experiences/Perceptions of mind are the reverse process of generation of bhavah / artha(thought/feeling/sense/meaning/understanding/insight)

CONCEPT DIAGRAM VII

MODES OF LANGUAGE ACQUISITION AND COMMUNICATION





Note: *Vivartanam = purodhana - tirodhanayutavartanamor parivartanam* is Reversible Becoming of *sphota*, the infrasonic mental energy pulse series-facilitating human language acquisition and communication.

Language acquisition/communication is a combined operation of ear/vocal chords (pronunciation), Eye/hand (to see and write shapes of alphabet) in conjugation with cognitive states of mind and modes of language acquisition and communication.

APPENDIX:

Glossary

Aatmajnaana/Brahmajnaana: Indian spiritual knowledge of the Self

Aatman/Brahman/Adaha: Self – providing us mental time-space and consciousness /awareness/ *dristi*; the result of breathing process; generator of mental energy pulses; is both the instrumental (*nimitta kaarana*) and material cause (*upaadaana kaarana*) for the formation of inner mental world and its retrieval;source, guide and energy-provider for the human mind and its activities.

Adhyasa: super-imposition of self-consciousness on pure consciousness forming veil thus concealing the experience of sate of Atman/Brahman

Advaita: no two – only aham-aham - phase of mind when mind is not functioning. State of bhakti, tatpara, taatparya

Advaita siddhanta: Integrated psychology

Aham: relates to *Atman*, the unoccupiedawareness or pure consciousness when no

mental cognitions taking place

Antahkaranas: inner mental tools - *manas, buddhi, chittam, ahamkaaram*

Antarmukha dristi: awareness of within of the body known as occupied awareness-*maanasika dristi* – tuning of mind with inner mental world

annamaya kosa: Getting tuned to and sensing stimuli from external physical world through sense organs and reception

(aanaandamaya kosa): Awareness of understanding/intuition/urge/mood/experience/meaning/experience

Avidya: state of mind when secular cognitions and communications take place

Bahirmukha dristi: awareness of without of the body (last two together is known as occupied awareness- *maanasika dristi* - tuning of mind with outside physical world

Bhakti: tatpara, taatparya, puport, import state of mind

Brain waves:Patterns of activation of brain neurons produce four types of brain waves:

a. **Alpha Waves:** These rhythmic waves occur at a frequency of about 8—13 Hz. One hertz is one cycle per second. Alpha waves are present in the EEGs of nearly all normal individuals when they are awake and resting with their eyes closed. These waves disappear entirely during sleep. (*Jagrat Sushupti* - Wakeful Sleep Conscious State)

b. **Beta Waves:** The frequency of these waves is between 14 and 30 HZ. Beta waves generally appear when the nervous system is active—that is, during periods of sensory input and mental activity. [*Jagrat* (Wakeful/Awakened) and *Swapna* (Dream) Conscious States).

(c) **Theta Waves:** These waves have frequencies of 4-7 HZ. Theta waves normally occur in children, and adults experiencing emotional stress. They also occur in many disorders of the brain.

(d) **Delta Waves:** The frequency of these waves is 1-5 Hz. Delta waves occur during deep sleep in adults, but they are normal in awake infants. When produced by an awake adult they indicate brain damage. (*Sushupti* – Deep Sleep Conscious State).

chidaabhasa or maya / pranavam/sphota: the carrier (in the sense of carrier radio wave in broadcasting and reception process) cognitive-energy pulse series

dvaita: two – aham-idam-phase of mind when mental functions are taking place (simultaneous presence of *antarmukha dristi*-awareness of within of the body and *bahirmukha dristi*- awareness of the without of the body.

Gayatri mantra: *Aum bhoor bhuvah ssuvah Aum tat savitur vareanyam bhargo devasya dhimahi dhiyo yo nah prachodayat.* (May the Divine Luminescence which causes the conscious states/phases of mind- *bhooh* (*jagrat*/ wakeful/ awakened), *bhuvah* (*swapna*/dream)and *svah* (*sushupti*/deepsleep)- illuminate and inspire our intellect.)

Idam: Perceived inner mental world and collection of impressions by stimuli and stimuli-created experiences/moods/senses both is static and dynamic forms

icchasaki and artha sakti : both are biochemical forms of energy and are genetic/inherent/hormonal to the organism i.e., human-beings

Jada: Potential energy form; static form of mental impressions

Jagat/Prapancham/jagathi: dynamic and functional aspect of mind/cognitive state; also *Jagat* is the present continuous form of the root (*dhaatu*) '**jag**' meaning 'to move'. *Jagat* forms *adhyasa* on *sat* and pure consciousness (*paramaatma* state) (*chit*) becomes self-consciousness (*jeevaatma* state).

Jaagrat: wakefulphase of mind when tuned with outside physical world; *bahirmuka dristi*

Jaagrat sushupti/para: mode of consciousness/awareness; mind (Self) in infra-sonic form of energy; state of bhakti, moksha - mukti – nirvana (state of salvation/liberation), prajnaanam (unoccupied awareness/mental space), mouna (silence), santi (peace), aananda (bliss)

Jiva/jivatma: self – consciousness / collection of thoughts about individual

Jnaanendriyas: – five sense organs - sensitive to light – eyes - scene/form (*drusyam/roopam*); to sound – ears - word or other sounds (*sabda/dhvani*); to chemical – tongue - taste (*rasa*); to chemical – nose – smell (*gandha*) and to heat or mechanical – skin - touch (*sparsa*)

Jnaana sakti: electrochemical form of energy through which cognitions and communications take place

Kriya sakti: mechanical form of energy which performs all actions of karmendriyas – action organs

Karana sareera: awareness of mood, experience, sense, urge, meaning, intuition, volition, understanding, insight as verb without subject and object

Karmendriyas: five action organs (*karmendriyanai-vak* (speech), *paani* (movement of hands), *paada* (movement of legs) , *paayu* (movement of bowels) and *upastha* (movements relating to reproductive organ).

Kriya sakti madhyama: mode of sentence; in *subject-verb-object* (the triad-*triputi*) form-electrochemical form of energy

manomaya kosa: Perception/thinking/reasoning/feeling in accordance with the stimuli from external world or information retrieved from inner mental world

Medha: seat and guide of mental functions according to Indian spiritual thought

Mithya: unreal; virtual; transient; present now disappears next moment/impermanent

Mithyham: false identity of "I"

Na aparah: not different

paramaatma: The state of Divinity/Self/Atman/Brahman

pasyanti: mode of verb or sense or mood or experience in biochemical form of energy

praanamaya kosa: Actions, reactions or interactions with external physical world activated by hormones or stored information

pramaana [prarkshya (direct through sense organs) – anumaana – inference-sabda/aagama – authority of seers and texts]: means and validity of cognition

Purodhaana: forward becoming

Rajo guna: *antahkarana* or sentence mode

Sabdabrahma Siddhanta: throws light on language learning and communication processes

Shad Darshanas: Six Indian philosophical systems dealing with cognitive science – nyaya, vaiseshika, yoga, saamkhya, poorva meemamsa, uttara meemamsa (Vedanta)

Sapta lokas: *Sapta lokas* (*lokyate itilokah*- what is seen is *loka* – a state of mind) -- *Laukika Jnanadayakaropa Bhooloka* (*jagrat*/ awakened/wakeful conscious/mental state) and *Bhuvarloka* (*swapna*/dream conscious/mental state), the *swararopa suvarloka* (*sushupti*/deep sleep conscious/mental unawareness state), *buddhiroopamaharloka* (phase of intellectual operations), *pranayuta ahamkaararopa janoloka* (origin, form, structure, cessation and re-creation of egoistic mind state), *tapoloka* (one-pointed meditative mental state) and *Sat-Chit-Ananda roopa* eternal awareness-providing *Satyaloka* (egoless/ego-transcending conscious state, which exists in all the conscious/mental states and at all times-physical or psychological))- are manifestations of and contain in and by *Brahman/Atman*

Sattva guna: state of mere awareness or of cognitions/communications about Divinity

Sat-chit-aananda: *Atman is sat-chit-ananda*. *Sat* is the present continuous form of the root (*dhaatu- verb root*) ‘*as*’ meaning ‘to be’; *sat* refers to awareness/consciousness being/existence. *Chit* refers to pure consciousness – knowledge acquisition/communication aspect and *aananda* refers to experiences aspect of human mental impressions

Sristi: mental creations of cognitions and self-consciousness

Sthula sareera: awareness of body, its parts, and outside physical world and their mention as *vaikhari* (utterance as sounds) mode of language

Suddhaaham: real identity of ‘I’ as *Atman/Brahman/Self*

Suddha sattava guna: which amounts to *nirguna* state, during which mental functions cease be. Cognition/communication-free state of mind

Sushupti: State of cessation of mental functions; similar to zero in number system and vacuum in natural sciences.

Sukshma sareera: awareness of thoughts, feelings, perceptions, self-consciousness, inner mental world as sentences with subject and object

swapna: dream phase or consciousness state of mind in tune with within mental world – *antarmuka dristi*

Tamas: state of non-cognition/experience of State of Brahman/Self

Tamoguna: state of mind when cognitions and communications taking place; in awareness of *vishayas* (object-energy forms or relative stimulated experiences)

Tanmaatras: stimuli by object energy forms sensed by sense organs

Tirodhaana: backward or reverse becoming

Triputi: dvaita phase of mind when differentiated perception of knower-knowing-known or subject-verb-object is present

vaikhari: mode of utterance in sound form of energy

vasanas: object-experiences/experiences/moods/senses created by the stimuli

vidya: state of jnaana and prajnaana; also means knowledge about Atman and way of meditation on the Self/Atman/Brahman

vijnaanamaya kosa: Conversion of above information into intelligible information as understanding or insight or experience

vishayas: object energy forms/ stimulated experiences/ cognitions and cognition created experiences

visraanta dristi or **aatma dristi:** unoccupied awareness or pure consciousness (of Self/Atman)

Vivartanam : *purodhana - tirodhana yuta vartanam* or *parivartanam* is Reversible Becoming of *maya/pranavam/sphota*, the infrasonic mental energy pulse series-facilitating human cognition and language acquisition and communication

Vritti: *antahkaranama parinamastate* - transformation innermental tools - mode of mental functions

Yoga: a conscious process of evolution of individual consciousness- the stalling and controlling of cognition process:

Upanishads: Indian spiritual texts of science on human mind

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