

A COMPLEX NUMBER NOTATION OF NATURE OF TIME: AN ANCIENT INDIAN INSIGHT

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Abstract

The nature of time is perceived by intellectuals variedly. An attempt is made in this paper to reconcile such varied views in the light of the Upanishads and related Indian spiritual and philosophical texts. The complex analysis of modern mathematics is used to represent the nature and presentation physical and psychological times so differentiated. Also the relation between time and energy is probed using uncertainty relations, forms of energy and phases of matter.

Key words: classical time; quantum time; cosmic time; qualitative and quantitative times; missing of time; scalar and vector natures of time; special theory of relativity; general theory of relativity; complex time; real and imaginary dimensions of physical time; biological time; time in conscious awareness; past, present and future in physical and psychological times.

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Introduction:

The study and research in the field of vedic (Ancient Indian) literature is highly relevant not only for a complete understanding of Indian intellectual heritage but also from the modern science and technology point of view. As the source of all knowledge, Vedas and other ancient intellectual, poetical and philosophical works speak of time too. Ever since the dawn of consciousness and creativity, humans have tried in all societies and civilizations, to interpret universe and their lives through an understanding of natural phenomenon and cosmic phenomenon too. East and west contributed immensely about the nature of time.

Thinkers have been attempting to understand the nature of time since the start of civilizations. Many intellectuals through generations have been expressing thoughts which aid us in the understanding of the nature and structure of time [1-18]. Ancient Indians, the Chinese and the Greeks and many western and eastern scientists and philosophers have made substantial contributions in this regard [10], (also see Figure I and concept Diagram I). An attempt is made in this article to get an understanding of time and thought process using basic physics principles and ancient Indian wisdom as revealed in the *Upanishads*. Our observation and experience recognize physical and psychological existences to time. And a complex number notation of nature of time is elucidated from ancient Indian insight and presented in tune with modern scientific and mathematical terms.

Ideas of Indian schools of thought on the nature of time:

(a). Upanishads:

Prajnaanam Brahmaa : Awareness of Self (*Atman*) is Time (*Upanishads*).

Prajnanam is divided as *Jagrat, Swapna, Sushupthi and, Jagrat-sushupthi Atma Dasa.*

DRISTYAHA --- CONSCIOUSNESS AND AWARENESS ATMA DRISTIHI SADAA

VIDYATE : *Maanasika dristihi atmadrityaam upari adhyasa*

Atma dristihi Visranta dristihi: Maanasika driste dve; Bahirmukha Dristihi Aantarmukha Dristihi iti

Pure Consciousness transcends Time and Space Consciousnesses [10-17].

(b). Suddhaadvaita:

Consciousness of Time and Space are not real.

(c). Saaktaadvaita:

Time and space are synonyms of energy

(d). Vedaanta:

Transformation of *Chit* (psychic) energy is Time (*Vedanta Darsana*).

Kaalaha parinaamaha; kaalaha saktyaaha parinaamaha. (Viswa Meemaamsa). [10]

(e). Nyaya - Vaiseshika System [18]:

In the *nyaya-vaiseshika* pluralistic school time along with space are but two of nine equally fundamental realities. As one of the transcendental realities, time is conceived as static; it does not flow as described by western scientists like Newton. As such Time cannot be directly

perceived but only inferred from motion or change. Nevertheless, time is regarded as a necessary condition for change and movement. In other words, changes are time, time itself cannot change.

(f). Samkhya-Yoga System [18]:

For the dualistic *Samkhya-Yoga* schools, time and space are irreducible realities. *Purusha* (Consciousness) and *prakruti* are the underlying ground or principle which makes possible all movement and becoming. In these traditions, time is considered absolutely inseparable from change, or becoming or motion which are essential characteristics of *prakruti*. It has been said that the contact of *prakruti* and *purusha* is affected through the element of time. (this is nothing but *consciousness becoming, the combination of awareness – mood, thought/feeling, utterance*).

(g) : Advaita school of Samkara [10-18]:

Only timeless *Brahman* is real, time itself has no absolute reality. The ultimate individual Self, also beyond the ensnaring concerns of this world, is *Atman* -- the indestructible spirit of Brahman present in men and women.

Time, Space and the Universe are seen as but transient manifestations which arise from repetitively during the *jagrat* (*bahirmukha dristi state*) and *swapna* (*antarmukha dristi state*) conscious states and return to *Brahman* during *sushupti* and *jagrat sushupti* conscious states of mind also known as *visraanta drishti* states. (see Table I).

Kaalaha tu avidyaiva tasyaa eva sarvaadhartvaat – Siddhanta Bindu, Pa: 16

(f). Present Perception (Modern Science and Philosophy):

Time is movement, change or becoming.

The **construction** and **structure** of time in these disciplines is different from that of modern physics and cosmology [10]. It is discussed here various constructions and structures of time in natural systems, including manmade.

Construction of natural scientific systems or processes as time:

Human observation and experience recognize physical and psychological existences of time Ramabrahmam [6-10].

Natural sciences such as physics, chemistry and biology give us insight of time variedly. Movement, change and becoming are three classifications of time available [1]. These classifications can be understood by observing physical, chemical and biological processes as follows.

i) **Movement:** Matter and energy are engaged in all natural or non-natural processes. Matter can exist as solid, liquid, gas (vapor) or plasma (ionic form) at a given time and space; energy can exist in many forms.

Matter and energy can be in (i) a state of rest or (ii) a state of motion. Aristotle opined time as counting of and reciprocal to motion. Motion associated with matter can be translation, rotation and vibration and periodic or non-periodic. Plato opined time is generated by cosmological movements. Thus movement has been construed to be time and also the cause of time.

ii) **Change:** The phase or state of matter is changed by energy and the form of energy is changed through matter [7] Thus transformation of phase or state of matter or form of energy takes place with mutual help. Natural or non-natural processes involve transformation of both matter and energy bringing out changes to within or without of matter.

Thus all physical and chemical changes are **constructed** as time.

iii) **Becoming:** Biology is the natural science dealing with living systems. We will be aware of physical changes of an organism – the result of physicochemical changes within - as growth or decay. A plant becomes a tree. A girl becomes youthful. These two becomings (transformations) are growth of organisms. Tree becomes dead-wood. Youthful woman becomes an old woman. These two becomings are decay or degeneration of the organisms.

The psychological process of a human being **becoming** angry and **being** peaceful after the anger subsides, is also biological process involving changes in and changes of psychic energy. Human knowing, learning, thoughts, perceptions, understandings and experiences are other mental processes which are two way-becoming of psychic energy [9]. Thus all physical, chemical and biological matter has phases of origin, **being/becoming** and dissolution (cessation) which are becomings associated with matter and energy. Thus becoming is construed as time.

(f). Ramabrahman: *Es gibt keine Zeit. Es gibt nur prozeße.* There is no time. There is only ongoing of processes. Time and Space Perceptions are relative to conscious state.

The following phenomena are normally assumed as the passage of time [10]:

- a) Movement –translation, rotation or vibration– (or transition) of matter in space.
- b) Changes in the state or phase of matter (by the aid of energy).
- c) Transformation of energy from one form to another form either through matter or otherwise.
- d) Being and becoming (growth and decay) of organisms.
- e) The in-built order of happenings guided by natural forces in natural or non-natural processes.
- f) The ability of human mind to perceive, record, retrieve and expect various happenings taking place in physical time.

Gist of above expressions: The Being and Becoming of Mind: Time - transcendence (Self-realization) and Time [6-17]:

Thus philosophy and Sciences have one thing in common—both are engaged in seeking and arriving at TRUTH, i.e., What IS? *Vedanta* philosophy which is *Sat-Darsana* is synonymous with *Sat* or Truth revealed. The process of arriving at and experiencing TRUTH is technically termed as SELF REALISATION in *Vedanta*, the mine of expressions about SELF—the ultimate REALITY.

Such a spiritual tradition suggests that the aim of human birth is to cease to be ‘human’ and ;be DIVINE. The adjective ‘human’ in human-being refers to the ecstasies, excitements, grieves, ache, fears, anxieties, thrills, sense of achievements or disappointments and many other psychological comforts or discomforts felt or experienced by men and women during the course of life. A human-being is tired of these psychological pulls and pushes and craves for relief from this chain of states of emotional disorders and be peaceful. Some others study *Vedanta* for acquiring knowledge and to satisfy their intellectual curiosity. Arriving at Truth gives peace in both the cases.

Peace is a Divine Quality. So are Pure Consciousness, Being, Bliss, Silence, Timelessness, etc. The mental process in which one can attain these qualities of Divinity or how a human-being transforms oneself into a Divine Being is known as meditation on the SELF which is the Real Nature of the individual. SELF, BRAHMAN, ATMAN are other names for DIVINE BEING.

Timelessness is the phase of mind when the self-consciousness has merged in the divine Consciousness. One can make this as object of meditation to know both the nature of Time and the nature of *Paramaatma* as time-transcendent Being.

Eka Vastu Chintanameva Dhyanam – is a definition of the meditation. This means that meditation is contemplation on a Divine Quality and finally merging mind into that Quality and Be That, is SELF REALIZATION.

Theology proposes Bhakti – the path of devotion for this purpose. In this method the mind concentrates on a Name or Form of a choice Divine Being and meditation on that Name or Form- which are nothing but SELF's MANIFESTATIONS—mind becomes on-pointed. At the appropriate moment Divine Grace showers and makes the mind, merge in that Name or Form.

Dhyanam Artha Bhavanam is another definition of meditation. This is the path of knowledge. This meditation process involves in concentrating the mind in the study and learning and hence understanding the Divine Nature. This is the *Upanishadic* and *Darsana* Path.

Upanishads contain descriptions of the SELF and many ways of meditation on the Self, known as *Vidya* or *Upasana*. The knowledges other than that of the Self are termed as *Avidya* by the *Upanishadic* Seers. According to their definition *Avidya* consists of all sciences, arts, skills, learning- of languages and other disciplines and art-forms

Isaavaasyoopanishat counsels to make use of both *Vidya* and *Avidya* while meditating on the Self and warns that using only one of them leads to darkness- the *Upanishadic* term for ignorance (*sloka* 9). Eleventh sloka of this Upanishad gives us the proper way of meditating on the Self,

*Vidyaam chaavidyam cha yastadvedoobhyam saha
Avidyaya a mr tyum teertvaa vidyayaa 'mritam asnute*

This means that one must contemplate on and be aware of the Self by using both *Avidya* and *Vidya*. Through *Avidya* one crosses mortality and by *Vidya* one attains immortality. Thus knowledge about both *Vidya* and *Avidya* is necessary for one to meditate on the Self and live as Self.

The *antahkaranas* as are responsible for us to get, revel on, entangled in and come out of, the perceived and edternal world and also for acquiring knowledge and make active the in-built tendencies- i.e., the *arishadvartaas*. All this knowing or mental activity which is names as Tamas (ignorance), blocks the SEER (*sat*) and makes one view only the Seen (*jagat*). Hence all this activity of *antahkaranas* with perceived or external world and the respective experiences, is *Ajnana* from Vedanta point of view.

The term *Ajnana* herein is used not at all to belittle any of the acquired knowledges or their eminence but only to point out that Truth, Self, Pure Consciousness or *Prajnaanam* outlives rather transcends all these perceptions, intellectual operations, self-consciousness, experiences and their recollections by Being, manifesting as and in, causing, maintaining and observing the origin, becoming and cessation of all these mental functions carried out by *antahkaranas*- and is the Ultimate *Jnaana*.

Mind as *antahkarana* is like a boat in the river of consciousness and the self-consciousness of the person is the individual travelling in the boat. The boat helps the person to move on in the

course of the life and at the end the river, the boat and the individual together merge in the sea of pure consciousness. Thus meditation is a travel on the mind-boat by the meditator to reach the Self, the Divinity and BE IT. After this merger with the Divinity no trace of the meditator or the meditative tool (the mind) are left (remain). Only object-free meditation goes on-which is nothing but the Blissful State of the Self.

An individual by his *samskaara* gets attracted to the use of one of the *antahkaranas* as meditating tool and proceeds on with meditation. Different meditative techniques are available to suit the temperament and mental makeup and mental preparedness of the individual. The present paper uses the path of knowledge using the *antahkarana Buddhi* and the *Avidya*-physics- to probe into and understand the nature of the Self and realize IT. This is a modern scientific *vidya*-the *saptama darsana*.

Natural Sciences reveal the truths of the physical world and philosophy reveals the Truths of the mental world. Physics is a natural scientific discipline which studies the various actions, reactions and interactions concerning matter, energy in space and Time and thus provides the necessary software to understand natural processes. The concepts of matter, energy, Space and Time are carefully and usefully developed in Physics. Of these concepts, the concept of Time is useful for the mediation on the Self, as Divinity is defined as Timeless or Eternal. It can be remembered here that Krishna *Paramatma* has declared in the *Bhagawadgita* that I AM TIME (*Aham kalosmi*).

As discussed above from all schools and modern science, ancient Indian spiritual and philosophical texts, and natural sciences define Time as (a) Movement, (b) Change and (c) Becoming. A school of thought equated time with movement. Thus all movements of matter or energy are Time. Change is time, means that all changes of phases of matter or changes of form of energy are Time. The third definition of Time as Becoming is useful for our mediation purpose. A plant growing into a tree or a girl developing into a woman are Becomings. All natural processes within and without the organisms involving changes and exchanges of matter and energy are becomings and hence are Time. It must be noted that plant becoming tree or girl becoming woman are irreversible processes. These becomings are linear and are uni-directional.

But some natural processes are reversible and happen both in forward and backward directions. All mental processes are examples of this kind of becomings. Let us consider the case of one becoming angry. This becoming angry is a transient phase of mind- which has beginning, being and cessation. Vedanta says any phenomena which has a becoming and an end is 'unreal'. After anger subsides one is peaceful. Thus we can see Peace is the normal state of mind, the natural state of human being. Anger and all such emotions are unnatural or excited states of the mind and are Becomings of human-Being. The excited states arise, dwell in and cease to be in human-Being. All mental disturbances the functions – the learnings, acquiring of knowledges, recollections of knowledges--- are transient and reversible 'Becomings' of and in the human-being. This means that mental functions originate, exist and cease to be to another observing eternal Energy – Presence.

This Energy-Presence is the SELF or Brahman or *Atman* or *Prajnaanam* and is present always. This is the revelation and the essence of Upanishadic Teachings. It is interesting to note that BEING, PURE CONSCIOUSNESS AND BLISS are the characteristics of the Self described in the Upanishads, the *Sat*, *Chit* and *Ananda*.

Being is a present continuous form of the verb 'to be' and Becoming, the present continuous form of 'to become' – and both are present continuous forms, the becoming being the physical and psychological manifestation of the Being.

The natural state of human-being is BEING, the present continuous form of 'to be' and not becoming, the present continuous form of 'to become' – which is limited by past – i.e., the memories, the aches, the fears, the future – the anxieties, the fears and the imaginations. But normal state of a human being is a combination of series of Being and Becoming or Peace and Disturbance or Past and Future or alternates between all these and seldom is Being, the natural present continuous state.

One becomes something when one cognizes an object or uses an *antahkarana* or the mind, else when mind ceases to cognize one comes back to or Is in the natural state of Being. Becoming is a disturbance on this Being and makes one live in the unreal state of some becoming.

Mind, in the form of *antahkaranas*, is responsible for human-being getting transformed into a human- becoming. Luckily this transformation is transitory and reversible. These transformations of mind worry ordinary people. But the Realized souls are always aware of the transitory nature of these transformations and the simultaneous presence of the two present continuous forms – the Being and the Becoming – and ARE always BEINGS. They only view the becomings occurring within and without and are not concerned or touched by these 'unreal' happenings.

Vedanta talks about *Mithyham* or virtual Self. The virtual Self is the reflected Sat and is made up of the same stuff as Sat. This virtual Self is the first Becoming in the individual and is responsible and is contained in all mental functions, - which are its own transformations. Virtual self always – transforms itself as *antahkaranas* resulting in the perceptions and experiences which are viewed by and are aware to the Self in the different conscious states (Table I). The various transformations of the virtual Self as various *antahkaranas* to perform various mental functions and back to itself are the forward and backward i.e., reversible becomings. These becomings constitute the mental Times and the feeling of passage of Time in the individual. (See the block diagrams).

If these becomings – the thoughts, feelings, intellectual functions, perceptions, experiences, institutions, tendencies – all cease to happen or the virtual Self undergoes no transformations then it is Bliss, Peace, Silence' Eternity and hence Timelessness is experienced within and is observed by the Self as *Prajnaanam* or Seer. Self as Seer is always present and is eternal or Timeless or is a present continuous BEING.

Thus this knowledge of nature of Time as Becoming helps to understand mental becomings which are off-shoots of the Self as envisaged by Vedanta And this study transforms itself into a new meditative tool for the contemplation on the Self and becomes the *Vaijnanika Vidya*. Thus concepts of Time and transformations of Virtual self together with Vedanta constitute the Modern Scientific *Vidya* – the *Saptama Darsana* – for the benefit of both the believers and non – believers to help them to live in Divine Time forgetting local Times.

REAL AND IMAGINARY DIMENSIONS OF TIME-CONSCIOUSNESS (see also Figure I and concept diagram I): Present, past and future are the real and imaginary dimensions of time in human time-sense, time-awareness and notion of passage of time.

Mental Time and Psychological Time is mental energy transformation in the form of thoughts taking place in physical present. *In the light of understanding the nature of time in this way, it*

becomes essential to have an idea of the energy transformation during a process more, than the notion of progress of time. The progress of or passage of time is just the result of processes taking place or phenomena happening or occurring and human concern and observation of such happenings, involving processes-physical, chemical, biological, cosmic, psychological, social etc., and there is no passage of time in an universal way and sense and such a passage even if cultivated, monitored and *felt* is not physically real [7]. The insight that time is energy and energy transformation is passage of time, creating a sense of time and consciousness of time are further advanced to understand the creation and functioning of various human conscious states or phases of mind and functional and cognitive states of consciousness and mind.

Real and imaginary times: Present, past and future:

Physical present is the real time. Both past and future are imaginary times. The real time becomes past as memory and real time becomes future as fear, imagination, apprehension, doubt or worry. Both past and future are thought forms in the physical present (Figure I). Imaginary nature of time is psychological; it is neither real nor physical. In the absence of human concern or monitoring or memory or apprehension or planning no past or future exist. Then even their imaginary nature becomes extinct. The reality which was, is and will be, is simultaneous ongoing of process, physical, chemical, biological, cosmological etc.,, unrelated or unconnected or non-influencing, each other or one another. Classical, quantum and cosmic times are originated, created, constructed, sustained and terminated depending on the phases of matter, forms of energy, their actions and interactions in the domain of activity, solely initiated, guided, and terminated, by relevant nature forces.

$$\text{Time} = a + ib \text{ or } \text{Time} = a - ib$$

a is the + real part of time – present and present continuous

+ ib and – ib are imaginary parts of time

+ib is imagination, anxiety, fear, , doubt, worry, ego-related apprehensions – future

-ib is memory, aches, ego-related experiences

Time of conscious awareness and mental time: Present, past and future are the real and imaginary dimensions of physical time in human time-sense, time-awareness and notion of passage of time. *Present is real dimension and past and future are imaginary dimensions of physical time* (also see Figure I and Concept Diagram II and Table I).

Conclusions: The concept and notion that processes take place in time is not the reality. *Time does not pre-exist processes-natural or non-natural- and is only constructed as duration by natural forces initiating, sustaining and terminating such respective processes.* The reality that change - as movement or change or becoming – defines, manifests and constructs time is to be realized. Time is a consequence and not cause of processes. The presence of a universal time passing either absolutely or relatively is to be denied. A lot of contemplation about the non-presence of time: annihilation of time; eternity; instantaneous happening; Absence of happening must take place for arriving at a clear insight of nature of time (Physical time).

And psychological time is a complex number notation and expression of nature of time – present and present continuous being the real part and past and future being the imaginary parts. Time = Present + (past and or future) at a given moment. Thus Time of conscious awareness and mental time: Present, past and future are the real and imaginary dimensions of physical time in

human time-sense, time-awareness and notion of passage of time. *Present is real dimension and past and future are imaginary dimensions of physical time.*

The same thing can be applied to uncertainty principle as follows:

Uncertainty principle: Complex Time:

Complex conjugates: position x momentum p
 $a+ib$ $a-ib$

a = value of position relating to present

b = value momentum relating to past or future

 Energy E
 $x+iy$

Time t
 $x-iy$

x = value of energy relating to present

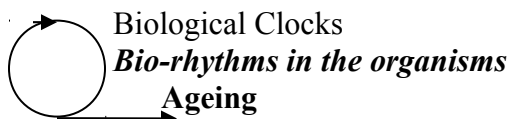
y = value or instant of time relating to past or future

FIGURE I

PICTORIAL REPRESENTATION OF *VARIOUS TIMES AND THEIR PASSAGE*

Physical time: Classical, quantum and cosmic times:

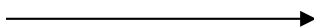
i *Biological rhythms*-tuned to 24 hour day and night cycle- *Cyclic*



ii *Spectrosopy* - molecular rotation and vibration – *discontinuous*



iii *Evolution and ageing* – *linear - irreversible*



iv *Thermodynamic View* – reversal of a process in certain bio-transformations



v *Fundamental Particle Physics View* – *Time reversal*

Unrelated to bio-systems



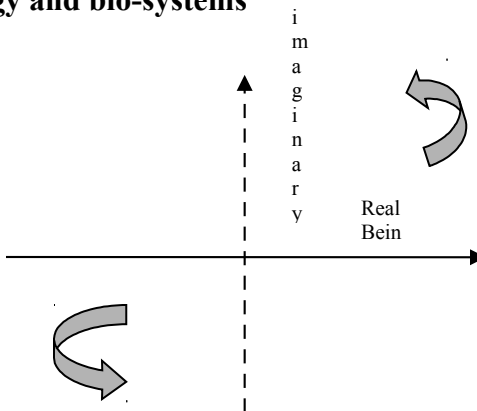
vi *Quantum time*: ⇌ ⇌ ⇌ ⇌ ⤴ ⤵ **Energy-time bits** transmitting, emitting and
 ⤵ ⤴ ⤴ ⤵ ⤴ ⤵ absorbing matter in photonic and ionic forms

vii *Special Relativity*: Speed of passage of time is a function of relative velocity between event and observer. **No relation to bio-systems**

viii *General Relativity*: Time-space inseparability–Shape; Warping **Unrelated to biology**

ix *Cosmology: cosmic time* Imaginary and real time

Unrelated to biology and bio-systems



Psychological Time (Real and Imaginary): Biochemical energy-transformations

Reversible mental energy transformation

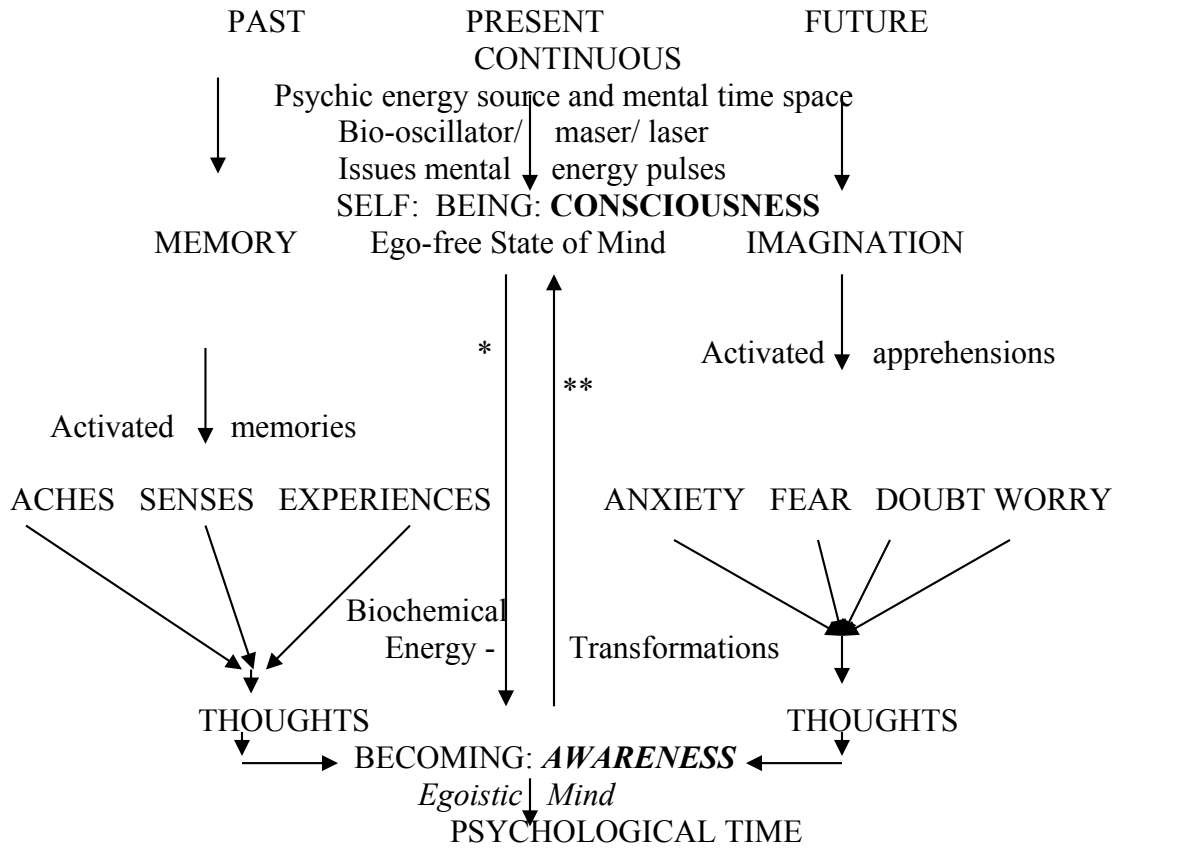
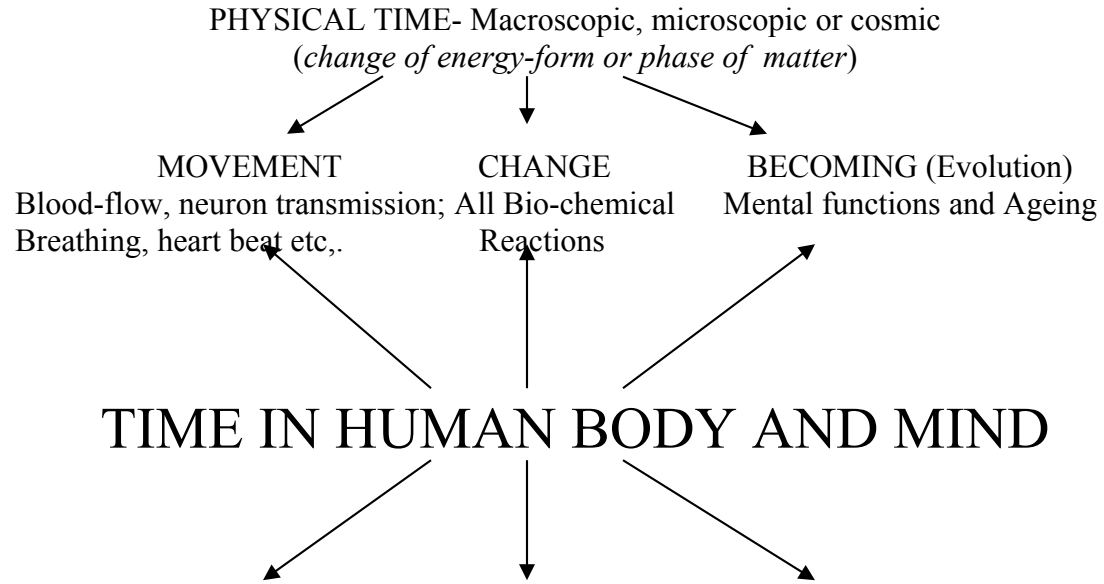
Present (real part) Pure consciousness Past and Future (imaginary parts)

Unoccupied awareness **Being** Mental Energy **Becoming** Occupied awareness

Phase of Cessation of mental functions ← Thoughts – Phase of Mental functions

CONCEPT DIAGRAM I

NATURE AND MANIFESTATION OF TIME IN HUMANS



*and ** - **Reversible becoming -vivartanam** (* modulation / ** demodulation)
of mental energy pulses - in physical present

TABLE I

DRISTYAHA --- CONSCIOUSNESS AND AWARENESS

*ATMA DRISTIHI SADAA VIDYATE Maanasika dristihi atmadristyaam upari adhyasa
Atma dristihi Visranta dristihi: Maanasika driste dve; Bahirmukha Dristihi Aantarmukha Dristihi iti*

BAHIRMUKHA DRISTI	ANTARMUKHA DRISTI	VISRANTA DRISTI
<i>PARAACHI</i>	<i>PRATEECHI</i>	<i>SANTHIHI</i>
<i>SANGAH</i>	<i>YOGAH</i>	<i>TYAGAH</i>
<i>VJNAANAM</i>	<i>PRAJNAANAM**</i>	<i>MAUNAM</i>
<i>STITHIHI</i>	<i>SARGAHA</i>	<i>PRALAYAHA</i>
<i>JAGARITAHA</i>	<i>SWAPNAM</i>	<i>SAMPRASAADAM</i>
<i>KARMA</i>	<i>TAPAHA</i>	<i>NIDRA</i>
<i>BHOGAHA</i>	<i>SAAYUJYAM</i>	<i>MUKTIHI</i>
<i>DIVAS</i>	<i>SANDHYA</i>	<i>RATHRI VA NISA</i>
<i>Atmanah vismarana samayam</i>	<i>Atmaanushandhaana samayam</i>	<i>Armaanubhava samayam</i>
<i>Dvaita</i>	<i>Dvaita</i>	<i>Advaita</i>
CONSCIOUNSEEE+AWARENESS	CONSCIOUSNESS+AWARENESS	CONSCIOUSNESS ONLY
AWARENESS OF WITHOUT	AWARENESS OF WITHIN	UNOCCUPIED AWARENESS
<i>JEEVA STHITHI</i>	<i>JEEVA STHITHI</i>	<i>PARAMAATMA STHITHI</i>
<i>INDIVIDUAL</i>	<i>INDIVIDUAL</i>	<i>DIVINE(Ego-transcending)</i>

** This *Prajnaanam* is **not** the *Prajnaanam* in “*Prajnnaam Brahma*”

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