

The Elusive Consciousness

Report of the Consciousness study Group, Ahmedabad in form of

Lecture notes compiled

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Preface

The problem of consciousness has occupied the human mind ever since people started understanding the difference between the living beings and non-living bodies. There are two terms used in Indian philosophy to understand this concept. They are *chetna* and *aatma*. Their equivalent terms in English are consciousness and soul. However, in the modern science, as the term used is consciousness which is interpreted mostly as *chetna* or awareness but many times this is interpreted as soul also. Consciousness is also used in the context of anesthesia to be given before carrying out a surgical operation. The concept of consciousness has been extensively discussed in Hinduism, Jainism and Buddhism from various view points. Similar is the case in western philosophy where Socrates, Plato and Aristotle have also dealt with it in great detail. With the development of science in general and concept of reductionism in particular, need for a separate entity like soul different from matter has been questioned. But a concept of consciousness or awareness has become very popular. The researches in the fields of anesthology, yoga and mediation in general and developments of technologies like Electro Cardiogram (ECG) and Electro Encephalogram (EEG) have brought new meanings to the concept of consciousness. The models of brain and search of neurons and synapses and power of their connectivity have provided a new dimension to the concept of consciousness. Similarly the detection of four different types of electric waves like Alpha, Beta, Gamma and Delta waves in the brain have provided even more insight into this concept and has established that the gamma wave pattern (frequency in the range of 40-80 Hz per second) is closely related with consciousness.

A totally new twist was given to the concept of consciousness with the advancement of quantum physics, which showed that smallest particles of matter like electrons, photons and other particles behave both like waves as well as particles (e.g. the famous double slit experiment), depending on the type of experimental set up used to observe a predefined characteristic, that is if the experiment is set up to observe their wave aspect, then the wave aspect will be observed and if the experiment is set up to observe the particle aspect then particle aspect will be observed. The decision to observe a given property is entirely determined by the state of the mind of the experimenter, which is, in turn, determined by his state of consciousness. In recent times, concept of quantum physics has been also used to explain the phenomenon of consciousness itself.

Recent developments in this field are covered during an international conference on consciousness which was organized by the Centre for Studies on Consciousness of the University of Arizona at Tucson during April 21-26, 2014. Interest among academicians in this field is reflected by the following observations. Around 1000 scientists from 60 countries participated in this conference and about 500 papers were presented in it. Experts from various fields like computer science, neuroscience, neurophysiology, anesthesiology, cognitive sciences, cybernetics, schools of medicines, bioengineering, artificial intelligence, physics, quantum biology, quantum computers, relativity theory, naturopathy, philosophy, psychology, religion, arts and many others were present.

In view of these developments, some scholars from different fields decided to form an informal group at Ahmedabad to regularly meet and discuss some of these developments and take these studies further. The major driving force for this activity was a feeling that India is a country where lot of work has been done in this field in the past, and where several concepts were developed through ages by several different religious groups which can make significant contributions to the current search for consciousness and soul. This document describes some of these efforts. It is mostly based on the work done by scholars coming from widely different fields which appear to be somehow related with the problem of consciousness.

We start with a lecture delivered by Prof. Achinta Yajnik, who covered the concept of soul and consciousness in Indian philosophy along with the current status in the modern science. She covered many interesting developments in science and also limitations of the current approaches like insufficient emphasis given to the Extra Sensory Perception (ESP).

Dr. Vishwa Mohan Thakore, MD in Clinical Psychology and a doctor of repute in Ahmedabad talks from his inner heart and believes that consciousness is the most fundamental entity in the world. Matter, space and time are all secondary.

Professor C R Mukundan, an internationally renowned scientist, a brain scientist turned behavioral scientist, talked of non-material nature of consciousness, and equated it with energy but showing that it is different from matter. He discussed space-time and their role in understanding the concept of consciousness. In the process he also touched upon the modern neurosciences and psychological dimension of consciousness.

Professor A R Prasanna an internationally known expert in the field of Relativity

talked about the role of time in understanding consciousness and laws of nature on which the whole foundation of science is based. He also talked of dilation of time, starting from the theory of relativity, going back to the Hindu scriptures where measures of time goes from the smallest part of time to trillions of years. It may be noted that the recent work of Prof. Lee Smolin regarding a new concept of time which is different from the terminology used in science is quite relevant in this context.

Bhandari and Pokharna in their paper on concept of knowledge and logic have described the limitations of the modern science in describing the reality. They have discussed the Godel's Incompleteness Theorems which although was developed about 70 years ago still remain unchallenged and illustrated why scientific methodology cannot provide complete knowledge about the reality. In the same context other systems of logic are also discussed like Syadvada from Jainism and explained through the wave-particle duality using the so called seven fold way of looking at reality and its knowledge as we perceive. These options seem to be related with the issue of consciousness.

Pokharna starts with an *ab initio* approach to show the limitations of the methodology of the modern science in describing the biological and human systems which are open, dynamic systems, constantly interacting with the environment and are irreversible in nature. The human systems also having memory and are goal directed systems. Hence need for General Systems Theory is being sought. He then described the quantum mechanical approaches, involving theory of relativity and neurophysiological researches to understand the concept of consciousness. He covered the Penrose and Hameroff model using method of Objective Reduction and possibility of information being stored in spin foams at quantum gravity level. The possibility of extra sensory perception and life after life was also mentioned, the ideas extensively discussed in Jainism.

In his second paper, he developed an analogy between the quantum field theory and the karma theory of Jainism which shows how the concept of elementary excitation of solid state physics and an orderly ground state of the system are similar to the karmas and the pure soul described in Jainism. Phenomena of *Shatavdhan* demonstrating extra ordinary memory and possibility of estimating sizes of smallest particles of matter during higher stages of consciousness were mentioned. These rare examples should be more deeply studied to determine the conditions under which they realized.

Professor Paras Mul Agarwal, another internationally famed quantum physicist

from Oklahoma University discusses his famous work related with the application of quantum physics in social systems. It is well known that human decision making is highly uncertain and is many times quite random and probabilistic. He briefly summarizes that the process of human decision making does not follow the laws of classical probability but rather follows probability theory developed for quantum physics. This study indicates that quantum physics may be playing a significant role in the process of understanding of consciousness.

Professor Narayan Lal Kachhara discusses the concept of soul and matter in Jainism, an ancient religion of origin in India. He describes interaction between soul and matter known as karma in Jainism in details. The subjective and objective nature of soul is discussed. The most important aspect of his presentation is description of forty seven characteristics of soul as given in Jainism, which could provide many new ideas to the modern science.

Professor Sudhir Shah, an eminent neurophysiologist of international repute, describes two case studies which is a big challenge to the modern science. The first describes case of Shri Hira Manak Moti who did fast for 411 days at a stretch taking only boiled water in the day and nothing in the night and no other solid or liquid food. Mr. Heera Manak Moti claims that his major source of energy was from the Sun. It appears that this is one of the phenomenon observed during what is known as higher stages of consciousness.

Second study which Dr. Sudhir Shah describes is an experiment conducted on a person who claims to have not taken any food, liquid or water for the last 75 years. This person is Shri Prahalad Bhai Jani, also known as "Mataji", being a disciple of "Amba Mata", a great deity worshipped in the whole India. He lives in a cave in Ambaji and occasionally come out for public to have his darshan. He agreed for a scientific experiment on himself for 11 days in which, he was locked in a room for observation and a team of 21 doctors from different fields of medical sciences studied him for several body parameters and made extensive measurements. They observed that his claims were completely true for 11 days at least. Again he is described by the public as a great saint living in a higher state of consciousness. These are very rare events. However, if we look at the history of science then we find that most of the new scientific discoveries took place with careful observations of a new phenomenon which was rare at that particular point of time. Thus discovery of a new element or a new galaxy or a new virus or any new phenomena were made. These rare phenomena are then studied and conditions under which they occur are found and these phenomena become quite common under that set of conditions. Similarly, the rare phenomena described above should

be also looked in the same manner. A question to be raised in the present context is why these phenomena occur during higher stages of consciousness and how they are related with actual properties of consciousness and its evolution.

This series of lectures is a small beginning in the direction of understanding the concept of consciousness from various perspectives. Right at the outset, we wish to state that we want to keep our scope of research quite broad. On one hand we wish to explore this concept from a scientific perspective and on the other, we wish to emphasise that a large number of mystic phenomena recorded in the breadth and length of the country should be properly explored, not necessarily in the scientific perspective only but also from more open frontiers of exploration, which goes beyond the space-time invariance conditions of the modern science. It might be necessary to think of totally new concepts and ideas. New types of experiments are required to understand the concept of consciousness and spirituality.

We wish to mention that these are just lecture notes and are so written in different formats. We have tried to organize them in a proper way and standardized them, but many issues are there which will be handled later. Thus references are not properly mentioned. Some papers in the process of editing and making them simple, some mathematical rigor has been left out. Thus in paper of Dr Agarwal, we have completely dropped all mathematical details (almost full paper and taking only introduction), but have kept the reference list and gave only introduction part for the knowledge of general readers. Other such errors may be there which may be excused.

Acknowledgement:

The idea of generating a group at Ahmedabad to discuss the work going on in the field of consciousness in the modern science and that in Indian philosophy was generated during a meeting of a committee constituted by the Bhagwan Mahavir International Center for Scientific Research and Social Innovative Studies, JVBI, Ladnu, Nagaur (Rajasthan), India. It was held at their Koba center in Gandhinagar, Gujarat. The editors are grateful to their organizers for encouragement and this initiative.

<1>. Spiritual Theory of Personality: Eastern & Western Perspective

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Science taught us that Universe is “Nothing But” a gigantic machine governed by certain Laws of Physics. (Newton) Life is “Nothing But” by-product of Matter (Darwin). Human Being is “Nothing But” a Robot governed by Brain as Developed Computer (Neuroscience). Behavior is “Nothing But” mechanical responses towards stimuli governed by laws of conditioning (Watson & Skinner).

“Nothing But” approach based on mechanistic paradigm penetrated human mind which led to “Existential Vacuum” and “Loss of Meaning” in life. As Ashe (1977) says,

“Thinking people tend to feel that science has cut man down. It has explained away every thing that matters in terms of smaller, meaner things that don’t matter. Religion is ‘nothing but’ wish-fulfilling fairy tales, love is nothing but body chemistry, art is ‘nothing but a surge of conditioned reflexes. Science leaves man shut-in, futile doomed...It feeds on the work of its countless laboratories to trap people in closed systems – chemical or biological or physical systems – where all color has gone and all hope is lost”. (Ashe, G. (1977). *Ancient Wisdom*. London: MacMillan. P. 12)

Thus, the mechanistic and behaviorist explanations of everything including man, with this ‘Nothing But’ approach have made the total life of modern man as hollow, ‘hope-less’ and purposeless.

Lack of meaning or purposelessness became the characteristic feature of 20th century man, which has been described by Schweitzer as “*Peculiar intellectual and spiritual fatigue*.” (Quoted from Randall, J. L. (1975). *Parapsychology & the Nature of life*, London: Harper & Row. P.62) by Coleman as “*Age of*

Anxiety”,(Coleman,J.C.(1983). Effective Behavior & Psychology. Bombay: Taraporewala.) and by Randall as the “*Spiritual bankruptcy of 20th century man*”.Victor Frankle describing this characteristic feeling of the age as “*Existential Vacuum*”, says,

“More and more patients are crowding our clinics and consulting rooms complaining of an inner emptiness, a sense of total and ultimate meaninglessness of their lives.”

In his investigations Frankle found that 81% of American students admitted of experiencing this feeling of total void. Frankle describes this fact of modern life as a challenge to psychiatry and finds its roots, like Roszak, in the wrong concept of man, the reductionist one, taught by modern science. In this context, Erikson rightly describes the crisis of modern youths as ‘*Identity crisis*’.

In short, in this contemporary context, there is an urgent need for such a concept of man which should be not only ‘holistic’ or ‘religious’ or “spiritual” underlying consciousness principle, and hence be capable of filling the inner void of modern man, but it should also be rational and the “scientific.” Because the concept of man invariably underlies all human interactions, Maslow rightly finds it more necessary to have proper understanding of man than to have atom bombs or factories. As he says,

“If we improve human nature, we improve all for we remove the principal causes of world disorders. But human improvement depends upon an understanding of human nature...It is for this reason that the world needs insights that psychology can with time produce. More than bombs or new religions or diplomats or factories, more than physical health and new drugs to win it, we need an improved human nature. It is for this reason that I feel a sense of historical urgency as well as an increased awareness of the responsibility of the psychologist. This is a responsibility to the human race and it should give the psychologist a Sense of Mission and a Weight of Duty beyond those of other scientists.”

In short, as a fundamental step towards the solution of the Individual, existential and the Cultural crisis of modern man, epistemological shift (Sorokin & Royce) in the concept of man is needed. The mankind has to be provided with a new concept of man, a new image of man or to say more technically, a new theory of personality which is holistic-spiritual, consciousness-based and scientific both, satisfying reason and intuition both. This is the reason why an attempt has been made here to derive a Spiritual Theory of Personality based primarily on Samkhya-

Yoga System of Indian philosophy which claims to be spiritual and holistic underlying consciousness principle. This consciousness-based concept of man presented here has also been evaluated critically in the light of latest empirical findings of physics, neurology, parapsychology, biology, psychology and other related disciplines, studying man scientifically and this consciousness based theory of man has been found to be empirically validated too.

Theoretical Crisis and Need for Consciousness Research:

Not only existential but theoretical crisis faced by the scientists of different disciplines also necessitates the Spirituality or Consciousness Research. e.g.

- Many findings of modern quantum physics like paradoxical nature of reality, dancing and unpredictable movement of electron at subatomic level as suggested by Heisenberg's Uncertainty Principle, mutually convertible nature of matter and energy, interconnectedness of matter at micro-subatomic level etc. suggest that matter is too complex to fit into the mechanistic paradigm of science.
- Similarly Wilder Penfield's research on epileptic patients, Nobel laureate neuroscientist John Eccles' analysis of a number of neurological findings, Split-brain studies of Roger Sperry, Karl Pribram's Holographic model, Libet's experiments on motor movements of conscious volition etc suggest that the materialistic monism (brain alone can explain mind) cannot explain logically the existing neurological findings.
- Serious gaps found in fossil record, findings about homologous organs, research about punctuated equilibrium, biological research by Alister Hardy, zoology professor at oxford, etc raise serious doubts against the biological orthodoxy of Darwinism.
- Undisputable findings of ESP experiments with highly significant results , Ian Stevenson's world-famous research on reincarnation, SPR's voluminous data on Mediumship and many other parapsychological researches point to the non-mechanistic and spiritual, consciousness-based explanation of human personality.
- Finally Third wave of Humanistic psychology by Abraham Maslow and Carl Rogers also imply that purely behavioristic and mechanistic explanation of human behavior are insufficient models to explain the above-normal self-actualized behavior of human beings.

In short, many empirical findings in various natural and behavioral sciences have raised serious doubts against mechanistic assumptions of science. The anomalies of these sciences represent the Theoretical Crisis and their explanation demands non-mechanistic and spiritual type of theory including consciousness aspect of reality.

Spiritual Theory of Personality (Yoga Psychology)

The Spiritual Theory of personality, as discussed here, is based on Indian philosophical wisdom. Indian Philosophical systems have been divided into two groups:

- Vaidic darshans and
- Avaidic darshans.

Six classical systems of Indian philosophy known as Nyaya-Vaisheshik, Samkhya-Yoga and Purva-Mimansa- Uttarmimansa are said to be vaidic philosophy who accept the authority of vedas, while Jaina, Bauddha and Charvak Philosophy are said to be avaidic philosophies. Barring Charvak, all the systems of philosophy accept, in one way or the other,

- Body-Self distinction., Triode of Body-Mind-Self
- The Self or soul as the transcendental principle of consciousness.
- Law of karma and principle of transmigration.
- Liberation to be the ultimate goal of life.
- Liberation underlies Self-realization which means realizing the self as different from body and as the transcendental principle of consciousness.

With reference to these commonly accepted principles about self and consciousness, an attempt is made here to present the most representative theory of human personality.

Though the spiritual theory of personality discussed here is primarily based on the

- Samkhya sutras of Kapil,
- Vijnabhikshu's commentary on it (Samkhya Pravachan Bhashya),
- Ishwarkrishna's Samkhya Karika and
- Vachaspati's commentary on it (Samkhya Tattva Kaumudi)

- Yoga sutras of Patanjali,
- The Geeta and
- The Upanishads,

an attempt is made here to present the most representative Indian theory of personality bracketing the metaphysical differences among various systems of Indian philosophy.

Representative Spiritual Theory of Personality based on Classical Indian Wisdom:

According to Indian psychology, human personality is constituted of two elements: The 'Body' and the 'Self'. Self refers to principle of pure consciousness and 'Body' refers to the matter component of personality. Body is enlivened because of its being the abode of self.

THE BODY:

Concept of Body is also peculiar in Indian psychology, according to which each individual has three bodies:

- Gross Body
- Subtle Body
- Casual Body

1. Gross Body : (Sthoola sharira)

Gross body is our physical body derived from our parents. Gross body is a part of the external material world of objects, constituted of the same elements, namely earth, water, fire, air and ether. 'Gross' denotes nothing but whatever is visible i.e. directly perceptible. (SPB 1.62). Thus, gross body, made up of flesh and bones is directly observable and it is the body with which the sciences of physiology and anatomy deal with. In Upanishadic terms, gross body can be said to be food sheath (Annamaya Kosha-Taittiriya Upanishad, 3.2.1)

2. Subtle Body (Sookshma-Sharira)

According to Indian psychology, each individual self is accompanied (enveloped) by one subtle body also, in addition to the physical body. Gross body alone is incapable of producing any experience. So, subtle body is "hypothesized" (STK. 39) Gross body and subtle body function together as a unit and thereby produce various cognitive, affective and behavioral experiences. As Swami

Yogeshwarananda Saraswati says,

“This astral (subtle) body is devoid of nerves, veins, arteries; of flesh and bones, it is made up of extremely subtle vapor-like elements, it is even devoid of limbs, but pervades the whole physical body.”

According to Indian psychology, this subtle body is constituted of **Nineteen** elements, namely; **Five** Senses of perception (of sound, touch, color, taste, and smell- Senses of cognition) **Five** Senses of action (speech, Handling, foot movement, evacuation and generation) **Four** Internal Organs (mind (manas), intellect (buddhi), memory (chitta) and ego (ahamkar) & **Five** Subtle elements (Tanmatras). As further explained, this subtle body is one for each self. (STK-40). It is relatively permanent as opposed to the gross body which is perishable (STK-39). Vascaspati says that,

“Because subtle body is devoid of experience, that is to say, because subtle body, by itself, is incapable of experience without the physical body, it migrates (STK-40), occupying one physical body after another. Kapila says that subtle body composed of seventeen elements (ego and chitta are included in intellect as Vijnanabhikshu comments- SPB-3.9) is one (SS-3.9), i.e. it is one and the same in every birth till emancipation. Thus, although subtle body is “permanent” (Nitya) in the sense that it does not quantitatively or materially change as the birth changes, it is one for one self which is eternal. That is every self is enveloped by one constant subtle body and different physical bodies in different births till the emancipation, which means the realization of the eternal blissful nature of self. Subtle body can also be said to be Mind which is not conscious but material in nature.

3. Causal Body:

According to Indian psychology, the subtle body accompanies the soul (self) in all its migrations. At the time of death, physical body dissolves but self, covered by the subtle body, migrates to assume another physical body according to the dispositions stored in Chitta or Causal Body which is structurally a part of subtle body only. This process of assuming one physical body after the other as per the dispositions of causal body, is known as ‘Samsara’ in Indian psychology which continues till the Self - realization occurs. Vacaspati says,

“Just as a dramatic actor playing different parts, acts like parasuram, or Yudhisthira or Vatsaraja, so does the subtle body, occupying various

physical bodies, act like a man or a brute or a tree.” (STK-42)

Kapila says that different individuals have different subtle bodies due to their different actions or karmas. (SS- 3.10) According to Indian psychology, each action or experience leaves its impressions in the form of ‘dispositions’ (Samskaras). In modern terminology of Western psychology these ‘dispositions’ or samskaras refer to the unconscious impressions of every experience. According to Indian psychology, this unconscious part of personality, includes the impressions of the actions or experiences of not only this life, but also those of all the past lives of the individual self in all its migrations, which are referred to as instincts or tendencies (Vasanas).

In short, the dispositional part of the mind, the part of the mind which is said to be the reservoir of all past, unconscious impressions, is most widely known as Chitta or causal body in Indian psychology.

This Chitta itself refers to ‘casual body’ in Indian psychology. In accordance with the dispositions of the casual bodies, different selves embodied by different subtle bodies, assume different physical bodies in different births. These differential dispositions are responsible for the differences in the birth of the individual (Jati), duration of life (Aayuh) and the particular experiences (Bhoga). Thus, structurally casual body as Chitta, is a part of subtle body but functionally it is the dynamic force responsible for the migration of subtle bodies.

Concept of Self

As stated earlier, according to Indian Psychology, personality is constituted of two parts: The Body and the Self. The Body represents the material component of personality which includes three bodies, namely the physical, subtle and the causal body. The **self refers to the Transcendental principle of Consciousness** which is ever-existing (**sat**), self-revealing & Conscious (**chit**) and blissful (**anand**) in nature. Self is responsible for one’s **Identity and Continuity** as a person.

It is important to note here that Indian psychology clearly distinguishes between mind and the self. Mind in Indian psychology is that hypothetical construct which is considered to be material and non-conscious. Mind is the subtle body which represents the material component of personality and hence it cannot be equated with the self which is the transcendental principle of pure, blissful consciousness and is the basis for one’s identity and continuity as a person.

Although self is transcendental, ever-existing, self-revealing and blissful, due to nescience and due to socialization process, self mistakenly identifies itself with the body(gross), mind(subtle) or with the world of objects and experiences pleasures and pains. When self is thus identified with non-self, it is called an **“empirical self”**. When self identifies with particular physical body, he assumes name and form as his empirical identity. Ego is the basis of one’s empirical identity. It is this empirical self which carries out entire range of activities and experiences resultant pleasures and pains through three states of consciousness, namely, Waking (Jagrata), Dreaming (Svapna) and Deep Sleep (Susupti). The **fourth** state of consciousness as described in Indian psychology is the state of transcendence (Turiya) in which self is experienced **as it is** without its mistaken identification with non-self. Mandukya Upanishad describes four states of consciousness in detail.

Self as basis of conscious Cognitions & Emotions:

According to Indian psychology, it is the self which makes each phenomenological experience a subjective conscious experience. All cognitions and perceptions are converted into conscious, subjective experiences due to mistaken identification of self with non-self, i.e. due to ego. Similarly, all our pleasures are also due to blissful nature of self. In other words, Just as the consciousness aspect of self is the fundamental basis of all our cognitions, the bliss aspect of self is the fundamental basis of all our enjoyments. According to Indian psychology, whatever happiness we experience in day-to-day life is due the blissful nature of self only, there is no happiness in outside world or in body or in mind. The ultimate source of happiness is the blissful nature of self. When the blissful self identifies with the objects, or with body and mind, we experience happiness. Brhadaranyaka Upanishad also says that whatever happiness the person experiences from any source, is due to the blissful nature of self only. (Br.Up. 2.5.1)

Just as the dog, trying to eat the hard bone, bleeds from his own mouth and then relishes the taste of the blood stuck on the bone, which is nothing but his own excretion, similarly, it is the self only, which through its essential quality of bliss, imparts happiness to worldly objects. Upanishad says that there is no bliss in anything finite, and self, being infinite or imperishable, is blissful.

Although bliss is the essential quality of the self, it is not experienced all the time because it is covered by ignorance. So, just as darkness shows absence of light, the experience of pain is veiling of the blissful nature of self due to ignorance.

Law of Karma, Transmigration and Liberation:

One of the very important dynamics of personality in Indian psychology is the Law of karma. It can be interpreted as purely a psychological principle of unconscious, according to which every action performed with underlying ego-identity, be it gross or subtle, be it physical, verbal or mental, leaves its impressions in the unconscious, known as causal body or chitta. All actions and experiences underlying ego, i.e. mistaken identification of self with non-self (body, mind or objects) leave their impressions in unconscious, i.e. in causal body.

Calculus of Law of Karma

If we try to present law of Karma mathematically in an equation form, it would be as under:

$$\text{KForce} = F/K.$$

$$\text{Karmic Force} = \text{Frequency/Knowledge}.$$

As the equation suggests, according to Law of karma, greater the frequency of an action, greater the Karmic Force. Similarly, greater the knowledge of the self, less would be the Karmic Force. If actions are performed with Self-Knowledge, i.e. without the mistaken identification of self with non-self, i.e. without the ego and attachment, i.e. with awareness of self of self as witness, then no karmic Force is created. Thus when knowledge tends to infinite, Karmic force tends to be zero. In short, each action done with ego-identity causes its impressions in the unconscious.

According to Law of karma, and principle of transmigration, it can be said that according to Indian psychology, as will be the actions, so will be the impressions (samskaras) and the tendencies (vasanas) and also so will the dominant tendencies at the time of death; as will be the dominant tendencies at the time of death, so will be the new physical body and as will be the physical body so will be the experiences.

In short, the self covered with the subtle body migrates from one life to another according to the contents of causal body till liberation. With the realization of true nature of self as eternal, blissful consciousness (satchitananda), the cycle of birth and death ends and the person is called to be liberated. The self-realization or the liberation, which constitutes the attainment of perennial source of bliss and end of

all miseries forever, is the ultimate goal of life. Karma Yoga, Jnana Yoga, Bhakti Yoga and Raj Yoga are the suggested ways to attain this Turiya state of consciousness which is a result of self-actualization as transcendental consciousness.

The self-actualized persons are described in the Geeta as Sthitprajnya. (Ch.2) The characteristics of Bhakta as stated in the 12th chapter or the characteristics of Gunatit as stated in 14th chapter of the Geeta or the characteristics of Bhagavat as described in the Bhagavatam also represent the characteristics of the self-actualized. Having realized the source of happiness within, they remain unmoved or unaffected by the pleasures and pains, gains and loss, by heat or cold or by honor or dishonor. No worldly objects, persons or situations make them happy or unhappy. Equi-poised state of mind is their natural state. They always dwell in eternal state of bliss, though doing all actions absolutely selflessly for the welfare of society. This Self is ever-existing, conscious and blissful and constitutes the substratum of entire universe. It is this self only which is the basis of interconnectedness of entire universe. Therefore with this self-realization, the Jivanmukta experiences oneness and interconnectedness of entire universe, oneness of mind and matter, oneness with all organisms. So They have world as their family (Vasudhaiv Kutumbakam).

Thus, according to Indian psychology, this self-actualization is the highest level of personality development. To reach up-to this level of psycho-spiritual evolution is the goal of human birth and is the ultimate motivation of all our actions according to Indian Psychology.

Scientific Correlates of Indian Theory of Personality

Following Hypothetical Constructs of Indian spiritual theory of personality have been critically evaluated in the light of corresponding empirical findings of various sciences and found to be empirically validated as under:

- Indian concept of senses and parapsychology
- Tanmatras, Parapsychology & Modern Particle Physics
- Indian & Western Theory of perception and Holography
- Indian concept of mind and Neuro-physiological findings
- Indian concept of Self and Theory of evolution in biology
- Law of Karma, Neurology and Psychoanalysis
- Self-actualization: Taittiriya Upanishad & Abraham Maslow
- Eight-fold path of Yoga: Patanjali and Charles Honorton

CONCLUSIONS

As the evolutionary and Darwinian biologist Wallace says, with the appearance of Man on evolutionary ladder, the direction of evolution changes from physical to mental. Because, with the advanced cerebral cortex of humans, nature does not control man but the Mind or Intellect controls the Nature through inventions of technology. So with the humans, Challenges would also be mental and Adaptations would also be mental, and only those would survive who have higher mental and moral development as Wallace says.

° “Thus man, (he wrote), by the mere capacity of clothing himself, and making weapons and tools, has taken away from nature that power of changing the external form and structure which she exercises over all other animals... man does this by means of his intellect alone, which enables him with an unchanged body still to keep in harmony with the changing universe. From the time therefore, when the social and sympathetic feelings came into active operation, and the intellectual and moral faculties become fairly developed, man would cease to be influenced by ‘natural selection’ in his physical form and structure. But from the moment that his body becomes stationary, his mind would become subject to those very influences from which his body had escaped; every slight variation in his mental and moral nature which should enable him better to guard against adverse circumstances, and combine for mutual comfort and protection, would be preserved and accumulated; the better and higher specimens of our race would therefore increase and spread, the lower and more brutal would give way and successively die out.”

(Quoted from Hardy A (1984). Darwin and the Spirit of Man. London: Collins. P. 75-76)

Thus now with the appearance of man on earth, the direction of evolution has become intellectual, moral and psycho-spiritual. This being so, to meet the Survival of the Fittest criterion, evolution of mankind necessitates evolution of consciousness and for that none other than India would prove to be the best source of information and guidance. Arnold Toyanbee in this context, rightly says that,

"It is already becoming clear that a chapter which had a Western beginning will have to have an Indian ending if it is not to end in the self-destruction of the human race. At this supremely dangerous moment in history, the only

way of salvation for mankind is the Indian way.” (Dr Arnold Toynbee, British Historian)

In this global context, study and research of consciousness is the Responsibility of Indian scholars. And if we apply Maslow’s words, we can say that

‘This is a responsibility to the human race and it should give the Indian Scholar a SENSE OF MISSION and a WEIGHT OF DUTY beyond those of other scholars.’

Modern Man’s Predicament, Existential Crisis & Need for Spirituality and Consciousness Research:

<2>. The Agents of Consciousness

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I believe that consciousness and its contents are all that exists. Spacetime, matter and fields never were the fundamental denizens of the universe but have always been, from their beginning, among the humbler contents of consciousness, dependent on it for their very being.

The world of our daily experience—the world of tables, chairs, stars and people, with their attendant shapes, smells, feels and sounds—is a species-specific user interface to a realm far more complex, a realm whose essential character is conscious. It is unlikely that the contents of our interface in any way resemble that realm. Indeed the usefulness of an interface requires, in general, that they do not. For the point of an interface, such as the windows interface on a computer, is simplification and ease of use. We click icons because this is quicker and less prone to error than editing megabytes of software or toggling voltages in circuits. Evolutionary pressures dictate that our species-specific interface, this world of our daily experience, should itself be a radical simplification, selected not for the exhaustive depiction of truth but for the mutable pragmatics of survival.

If this is right, if consciousness is fundamental, then we should not be surprised that, despite centuries of effort by the most brilliant of minds, there is as yet no physicalist theory of consciousness, no theory that explains how mindless matter or energy or fields could be, or cause, conscious experience. There are, of course, many proposals for where to find such a theory—perhaps in information, complexity, neurobiology, neural darwinism, discriminative mechanisms, quantum effects, or functional organization. But no proposal remotely approaches the minimal standards for a scientific theory: quantitative precision and novel prediction. If matter is but one of the humbler products of consciousness, then we should expect that consciousness itself cannot be theoretically derived from matter. The mind-body problem will be to physicalist ontology what black-body radiation was to classical mechanics: first a goad to its heroic defense, later the provenance of its final supersession.

The heroic defense will, I suspect, not soon be abandoned. For the defenders doubt that a replacement grounded in consciousness could attain the mathematical precision or impressive scope of physicalist science. It remains to be seen, of course, to what extent and how effectively mathematics can model consciousness. But there are fascinating hints: According to some of its interpretations, the mathematics of quantum theory is itself, already, a major advance in this project. And perhaps much of the mathematical progress in the perceptual and cognitive sciences can also be so interpreted. We shall see.

The mind-body problem may not fall within the scope of physicalist science, since this problem has, as yet, no bona fide physicalist theory. Its defenders can surely argue that this penury shows only that we have not been clever enough or that, until the right mutation chances by, we cannot be clever enough, to devise a physicalist theory. They may be right. But if we assume that consciousness is fundamental then the mind-body problem transforms from an attempt to bootstrap consciousness from matter into an attempt to bootstrap matter from consciousness. The latter bootstrap is, in principle, elementary: Matter, spacetime and physical objects are among the contents of consciousness.

The rules by which, for instance, human vision constructs colors, shapes, depths, motions, textures and objects, rules now emerging from psychophysical and computational studies in the cognitive sciences, can be read as a description, partial but mathematically precise, of this bootstrap. What we lose in this process are physical objects that exist independent of any observer. There is no sun or moon unless a conscious mind perceives them, for both are constructs of consciousness, icons in a species-specific user interface. To some this seems a patent absurdity, a *reductio* of the position, readily contradicted by experience and our best science. But our best science, our theory of the quantum, gives no such assurance. And experience once led us to believe the earth flat and the stars near. Perhaps, in due time, mind-independent objects will go the way of flat earth.

This view obviates no method or result of science, but integrates and reinterprets them in its framework. Consider, for instance, the quest for neural correlates of consciousness (NCC). This holy grail of physicalism can, and should, proceed unabated if consciousness is fundamental, for it constitutes a central investigation of our user interface. To the physicalist, an NCC is, potentially, a causal source of consciousness. If, however, consciousness is fundamental, then an NCC is a feature of our interface correlated with, but never causally responsible for, alterations of consciousness. Damage the brain, destroy the NCC, and consciousness is, no doubt, impaired. Yet neither the brain nor the NCC causes consciousness. Instead consciousness constructs the brain and the NCC. This is no

mystery. Drag a file's icon to the trash and the file is, no doubt, destroyed. Yet neither the icon nor the trash, each a mere pattern of pixels on a screen, causes its destruction. The icon is a simplification, a graphical correlate of the file's contents (GCC), intended to hide, not to instantiate, the complex web of causal relations.

<3>. Consciousness: Scientific Understanding from Reality Engagements

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Extensive relevant literature related to “consciousness,” indicate that “consciousness” was accepted in philosophy and early scientific thoughts, as an entity of the universe. Even in the modern philosophical thoughts, consciousness is referred to an entity, different from matter. Consciousness is also often equated to the energy, which has been referred in the Quantum theory. It is described as a form of energy or potential from which life in the material world has formed. The life energy remains the same, though biological cells change and different organs in different shapes are formed in various species of animals. What is important is the acceptance that life in the energy form does not die, when the former decays and perishes. Consciousness is equated to this energy within and outside the cells in the body, which helps the body stand up and carry on with activities, and the body become alive. Awareness has been described as a component of consciousness. Consciousness is a force, an independent entity beyond matter, which was encapsulated into matter or a body to become a living being. This is the line of thinking entertained by some who believe that consciousness may constitute the quantum material or the force. Consciousness is therefore, the same in all living beings, as differences are only in the body structures and functions. These thoughts on consciousness have very ancient origin and they are still supported by many thinkers and authors. Existence of a nonmaterialistic and nonbiological entity as a universal force, responsible for supporting life, was accepted from a spiritual point of view and then from a philosophical point of view. The proposal and its acceptance are based on the experiential supports for its presence. There is no scope to consider that the force of consciousness has been different in the different bodies that it occupies. Acceptance of existence of subtle biological and physical entities have been always based on the repeated objective verifications of their presence and effects that may precede, accompany, and follow, and the anomalies that may occur, when participation of components are controlled. Atoms and their particles are indeed there and as we have learnt to manipulate them, reconstruct matter, and use them for release of physical energy, though all these are achieved mainly in nonbiological materials.

Consciousness is the word or verbal label used for referring to the idea or concept of presence of energy as an entity of the universe, representing life, from which the material universe came into existence, with all the diversifications. The issues that are considered are the universality of the energy and the association between life and matter, when it can propel the matter as a living entity. Ideas are proposed to convey that universe came from nothing, or from a vacuum, though it has limitations as shown to be present in quantum vacuum. What is truly important in this endeavor is an attempt to propose and prove that life is a separate and independent entity and it cannot be considered an outcome of chemical or physical changes that occurred in the matter. Philosophically, consciousness was considered an independent entity and all forms of energy emanated from this, as mentioned about Parabrahma. People matched this energy with soul of the individual, and an individual ceases to live when consciousness leaves the body. Thus consciousness was considered as everlasting force, which could survive even after the destruction and decay of the body. The related ideas supported the top down philosophical view that we have always entertained about the presence of a super power creating the universe and managing the business of running the world. The game changes altogether when the same word “consciousness” as used in philosophy, is used to refer to a state of wakefulness in all living beings, especially animals and human beings, which needs to be studied from a scientific perspective.

The most difficult aspects of perception and knowing of the universe were related to the differences in perception and knowing, even though knowledge was always elicited from the perceptual notions received. Knowledge was only information, obtained through sensory-motor experiences and their semantic interpretations, and knowledge always helped control and executions in further sensory-motor processing. Knowledge provided information drawn from sensory-motor signals regarding relationships of the components of the universe. The relationships are to be always measured in the dimensions of space and time. Even though all space and time measured have been always related and limited to the difference between two or more points in space and time, we developed an illusionary notion of infiniteness of space and time and that matter exist in space and time. These illusionary notions of space and time, in turn, influenced all our thinking strategies, and we accepted infiniteness of space and time as an absolute condition of the universe. All human senses indeed have limited capacities to look into space and time, which are in fact, inferior to that of many animals on the earth. All philosophical thoughts about the origin and the existence of the universe have been intensely influenced by consideration of these illusionary notions.

The physical universe is composed of multitudes of matter and energy, and the concepts of space and time emerge when we try to identify and measure them. What is compelling and unavoidable is the fact that as we measure any aspect of the universe, we have to carry that out across space and time. There is no better definition of space and time than the classical ones used in the theory of relativity. Space can be defined only as the difference between two points, and time is the difference between two events. We define and decide space and time as per our convenience according to personal and/or scientific preference. Space and time are not there if we are to consider only one point of space and only one event. Space and time are two essential characteristics with which we present and study matter. All variations in the matter are across space and time, and we have no means to conceptualize matter or energy outside space and time. Space and time are therefore the property or characteristics of reality, which is matter. These two domains represent the continuation of matter. All human ideas are drawn through human sensory-motor systems and hence whatever we conceptualize of the universe are relative to the space and time considered, which cannot be handled outside the sensory-motor limits. We can indeed propose and make attempts to semantically create information about the universe or the matter in imaginary space and time that we may experientially or experimentally handle. For example, we can arrange words and say that an animal is black as well as white, or that an elephant is riding a mouse. This can only be the expression with words or lines of drawing knowingly arranged, or thinking of a psychotic mind, which has lost contacts with reality. That is what we consider an ultraparadoxical state of the mind, as opposite values and qualities are taken for simultaneous consideration. This is indeed reflective of a very significant functional capability of the brain-mind, that it can arrange words sequentially with or without creating a meaning, or create a meaning which may instantly be unreal, or later proven to be real. However, the words and their meaning are made when one thinks over them or attempts to convey the meanings or ideas to another brain-mind, whether the other brain succeeds in recreating the same effect or not. There is no way to create a physical reality outside the physical principles of reality. But we may believe that we have created an idea outside reality, as we speak of the black and white object, and we may remain unaware that the mind that created such idea has already broken down and it has no real contacts with the universe. The material world and all forms of energy can be measured and known only in relative manner, and we label ourselves alive, conscious, and wakeful, when we can make those reality contacts, make semantic interpretations, and respond to them, as and when needed. There is no way brain-mind can know or make contacts with reality without moving, i.e. changing space and time coordinates. It appears that this knowledge was partly conquered by the ancient minds when they proposed the concept of

Parabrahma. It is indeed an extraordinary suggestion semantically made by the human brain, even though the world created using those words cannot exist. It is true that the material world, the brain experiences is constituted by a spectrum of things that continuously vary in many respects. Space and time do not change on their own, it is a semantic fallacy, as they are not physical entities or properties. As matter continues in the same state or changes, both occur in space and time, another semantic way of expressing the same is to say that changes take place across space and time. However this would not mean that changes are taking place across domains of space and time. If there are no changes, there is no space and time either. When the live body of a man perishes, his space and time are over. His memories may continue in other minds, as long as they live. Immediate and distal effects of his actions may be experienced by those who survive him. There is also transfer of important signals with immediate and distal effects, transferred from one body to that of an offspring, which serves as transfer of biological memory.

The brain can create semantic relationships of sensory-motor experiences that occur within and outside as well as those which it imagines. We have learnt to experimentally and objectively verify these relationships, which prove the logics of the proposed relationship, and multiples of their close and distant psychobiological effects. The world and its reality components that we believed to have existed, before we developed the ability for objective verification, were only experientially verified and semantically explained. The question is about the veracity of the logics used for experiential verifications and explanations, as many of them may be unreal producing a world of fantasy. This is important as experiences are always influenced by suggestive effects of external influences and we have good amount of verified results of how hypnotic suggestions can alter perception in an individual. Critical thinking ability of the frontal cortex can be completely inhibited through such suggestions. Our own study using hypnotic suggestion has shown that amplitude of P300 ERP components representing recognition could be suppressed or increased using appropriate suggestions when the stimulus requiring recognition was still present or its intensity was decreased respectively, even though the sensory registration processes remained unaffected. Objective and repeated experimental verification is the foundation of scientific postulations, which cannot be substituted by experiential effects. Experience has its own value, as life is constituted, made exciting and meaningful by experiences and experiencing is the only subjective method of reality verification. An experience is not mere a reality contact or engagement, but full of emotional effects and their semantic effects, goal directed navigations which may be full of adventures and excitement, and meaningful achievements of goals in life. The experience of

living is therefore the greatest asset of life for each human being, as he could semantically interpret and define life as a saga of achievements, adventure, pleasure, and happiness. The need to survive and survival are only physical reality, everything else in life is semantically interpreted, created and controlled by emotional experiences. Each individual indeed has an option to define what he wants to experientially achieve in life, and work for achieving health, wealth, and happiness, while enjoying living.

Consciousness that we speak about in neuroscience is totally a different functional state of a living being. If we want to refer to life as a force, present in all living beings, it is indeed a great theoretical proposal. It is understandable that ancient minds were able to create such an idea, as they had relatively no knowledge of the biological systems and the role of the brain, and the significant differences in the capabilities of brains across species including that of human beings, as we understand these today. Living became the center of attention and curiosity in the ancient minds, as they considered life as a force encapsulated in the body. Life was conceptualized as an entity, which they equated to consciousness. There is no doubt that knowing about the presence life and learning to master and control life are still the greatest challenges. It is still beyond the scope of scientific studies and explanations, and we are probably in no better position than the ancient minds in explaining the origin of life. What is still not accepted by many is the fact that the human mind has developed the potential to define purposes and goals in life, and can learn to create methods to achieve those goals and work towards it. Many of the human minds, expect someone else to tell them and guide them in life. This approach necessitates that life is separated from matter, but biology has significance only when it is alive. If life is a separate entity and a singular force, differences in the body structures and their functions are irrelevant as all forms of living beings share the same life force – consciousness. Consciousness has no contribution to the extensive variations across species of animals including human beings, or to the differences within a group of species. These difference originate at a biological level of functioning among the living beings. Biological differences need to be studied as a scientific discipline and scientific inputs from all disciplines of knowledge may be needed, to recognize the beginning of life and biological growth and functions that each living being learns to master. Changes that occur in the biology of the body, which perishes after a span of time are to be estimated independently. We have not differentiated life and identified it as an entity or force, separate from biology in a live system.

Knowing that consciousness is a life force with independent existence, separate from the mater of the universe, is not only amazing but also mystifying

and intriguing. Any discussion on consciousness, from the point of view of neuroscience has no relevance in this context. On the other hand, we are also inspired and continuously challenged by the scientific knowledge in the domain of the neurocognitive processes which occur with and without awareness of the inputs, and the outputs from the body, brain-mind. In neuroscience, first of all, consciousness is not a force. We only refer to conscious processing, for referring to the use of personal controls knowingly used in processing inputs and outputs. A living being is considered conscious if it can carry on interacting with the external world and internal conditions with available sensory-motor processing abilities. Responding is controlled by sensory inputs, whereas actions are initiated by need states. Response may also be initiated without perception and awareness of perception, when they are initiated from memory or experiences. On the one hand, the brain attends selectively to sensory signals arriving from outside or generated within the body, and on the other hand the brain attends to information retrieved from memory. We call the later remembrance of autobiographic episodes, which is different from mere knowing or recognizing. Parts of the frontal brain (orbitofrontal cortex and anterior cingulate) function as controlling systems, whereas other centers remain and function as controlled systems. The controlling systems keep the controlled system under the inhibitory control, which use the inhibitory controls, as needed for the regulation of motor outputs, instinctive behavior, sensory inputs, and emotional arousal and its effects on behavior. Signals from the external world enter the brain in a sequential or simultaneous manner and the human brain has developed extensive processing capabilities based on the nature of signal flow into the brain. We have thereby a sequential processing method, different from simultaneous or parallel processing method. Neural cells develop both these methods through intensive training. These are the two major neural methods used for signal processing in the brain to interpret and create meanings of all signals arriving at the brain. Responding and acting have turned into two major domains of behavioral programming, resulting in learning piloting and navigating methods. Piloting needs feedback from the stimulus or the external world that controls the movements, whereas navigation uses a feedforward method allowing the brain learn to define purpose for actions, identify goals to achieve for serving the purpose, and plan, anticipate and execute the action plans for achieving the goals. The brain even learns to redefine goals and action plans as per the anticipated and actual effects. The brain learns to create meanings in a critically sequential manner, which allows it to know and master the physical laws that govern any change in the universe, and which enables the brain to create new strategies of controls and thereby create new realities in the universe. Sequential interpretations are the major semantic strategy used by the brain. Thinking, speaking and writing allows to arrange words for creating sequence of effects,

which one wants to create and communicate. The brain can monitor its own verbal creations and become verbally aware of the meanings created. Verbal awareness allows the brain to monitor its own semantic creations and know its own analysis methods and meanings created for making critical judgments about the appropriateness of the sequences created, using which the brain learns to critically rearrange the sequences of signals and create new and accurate meanings from them.

During the developmental states, each brain learns to be emotionally aroused, and also learns to control the emotional arousal. The brain learns these mainly through social conditioning in the early years of growth, so that a child learns to control the automatic neurogenesis or initiation of actions and responses. Development of thinking ability allows ability to create semantic relationships for understanding the functioning of the universe. When rational thoughts are created, they help to create new realities and even use them to change the world around us. This also allows the human brain create pure fictional ideas and imaginary world, entities and conditions, Today we enjoy them as science fiction. These are the instances when virtual realities may later become real. Rationality is one thing which we cannot dispense with in such creative efforts. The pattern of neural activation seen in the brain during engaging with realities, is also created when the brain is imagining the same experiential episodes as in remembering past autobiographic episodes. Brain activation in real and virtual engagements with reality resemble each other, induces many to spend their lives in fantasizing rather than encountering reality. Experiencing is indeed the only form of subjective reality verification method, which we all use moment to moment in the real life. However, the knowledge derived from such experiences may be erroneous as the relationships are understood based on the knowledge base available in the brain. For derivation of accurate knowledge, the relationships must be objectively and independently extracted and recreated, which is the basic rule of a scientific paradigm. It is indeed true that more and more people are leaving scientific engagements with reality, as they find engagements with virtual reality are equally fascinating for the brain. Addiction with virtual reality has long historical roots with human beings, which is described as “Maya” in Indian thoughts. It is now increasingly seen among the young, who enjoy engagements with virtual reality that they easily create for themselves. Human beings have always enjoyed living in virtual world and they have created beautiful and torturous empires and forces, and the game of controlling and governing the self and others replaces engagements with reality.

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<4>. TIME and SPACE – Real and Relative

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In the context of discussions on Consciousness, the question which has been often raised is about the role of Space and Time for body, mind and soul. Before going into the intricacies of these concepts, let us briefly try and understand the enigma of Time, purely from a scientific perspective.

The often raised questions about time are, is it real? is it reversible? can one travel back in time? Are the Physical laws eternal? In the following an attempt is made to raise the fundamental question of what Time is understood to be in Science, and how it is incorporated in the analysis of events in the Universe we are aware of.

The subjectivity of Time endorses the observer's limitations in drawing conclusions about the laws of Nature. The arrow of Time is a reality which tells us about what one means by progress in understanding of Nature and its laws, which may or may not be eternal.

Time, the most enigmatic of all concepts, perceived by the human mind is as elusive for definition, as its role in our lives. Our perception of time depends upon the change we notice, the change that happens at the same location. As one knows that there is nothing fixed in space, the same means point of location to fixed to itself, thus implying that the change one refers to is purely subjective. The events of experience, recorded as an ordered sequence, past, present and future, defines the notion of time. With this proviso, an objective definition of time may not be practicable.

While Newton considered time as an absolute entity, as something without relation to anything external, he also defined the notion of "duration" calling it common time, which helped him in defining the laws of motion, which involved the rate of change of position of a body. It is ironical that though Newton had accepted the notion of relative motion, he did not see the consequence of this on the measurement of duration, which Einstein later clarified and reduced the role of time from its pedestal and gave it the same status as that of space combining the

notions of space and time to space-time.

As Observation implies, communication of information between the observer and the observed, it is natural that the notion of Time gets intermingled with propagation of information and limitations of its measurement one can achieve. An important danger one has to reckon with at this point is the distinction between the physical measurement (using appliances) of time and the psychological perception of comprehension by the 'Mind'. For the present, let us restrict ourselves to the discussion of the Physical measurement of Time.

The main distinction between the views of Newton and Einstein, comes in the wake of the fact that Newton, who considered 'Action at a distance', had no restriction on the velocity of information propagation, which allowed events to happen at varied different locations in space at the same 'time' for all observers, a notion which Einstein rejected, and restricted the propagation of information to a finite velocity, the velocity of light 'c', (electromagnetic signal) and further stated that 'NO physical 'signal can travel faster than 'c'. This restriction, immediately rejects the notion of simultaneity for observers in different states of motion and further results in the measurement of duration getting to be different for different observers depending upon their velocities. This is the notion of 'time dilatation', a concept which got established by the experiments too.

It is interesting to mention at this point that the notion of time dilatation, seems to have been appreciated and accepted by the ancient Hindu notion of time as is clear from the following:

“ Where as the measures of the day, hour, and second have been understood universally with respect to celestial motions of Sun, Earth and Moon, there seems to have been scales of measuring duration ranging over a huge scale encompassing the micro to macro. The lowest being a 'kshana' or a nimisha, which is the time lapsed for twinkling of an eye and the largest being a Kalpa, defined as 25 years of Brahma, with one day of Brahma being equal to 8,640,000,000 years of humans. Further, a few years of humans was considered as a few kshanas for devas. Apart from this the notion of cyclicity of time is expressed as time being an endless procession of creation, preservation and dissolution.. with the Cosmology embracing units like truti lasting $1/1,000,000$ th part of a second and a maha manvantara lasting 311 trillion years.”[Essentially time is different for different beings, ie humans, Brahma and Deva, because they are moving at different speeds with respect to each other.]

Advanced technologies have developed aids to measure Time in very minute intervals as Nano and Pico seconds. How many can even picturise such intervals? The accuracy of measuring such intervals in normal human life is almost meaningless. What about a virus or a bacteria whose entire life may last only that long.

Doesn't this make one accept the notion that TIME is neither Eternal nor independent of the individual?

In some minds this could raise the doubt: **Is Time Real?**

As mentioned earlier, if Time is related to experience then it is as real as the experience itself, because one measures its passage with reference to the experience

Even the perception of duration significantly depends upon how one considers the importance of the event as very often we try and tend to forget unpleasant moment as something which happened long ago thus pushing it away from the Mind.

Apart from these conceptual questions about Time, what is important to understand is the direction or flow of time which is always in the forward direction. This is termed as the 'Arrow of Time', a term coined by sir Arthur Eddington in 1927, with which one distinguishes, Past, Present and Future. In order to appreciate the relevance of time order, it is useful to look at what one calls a Light cone structure in Space-time, as given by Minkowski, which splits the space time into two regions, the past and the future, showing that history of all particles come from past to present and go to future, staying within the light cone.

The fact that the light cone structure is **symmetrical** about the point **O** indicates that in principle, the **laws of physics** are **time symmetric**. Does it mean that one can go back in time to **re experience the past**? Unfortunately, Not!

One of the most **fundamental** of physical laws attributed to **Nature** is the '**Conservation of Energy**', and associated with it are the first and second laws of thermodynamics, which say that, Energy cannot be destroyed or created and if a system is isolated, (no exchange of energy between itself and its surroundings), the potential energy of its equilibrium state will always be less than that of its initial state. The statement can be understood in the following way.

Any isolated system, has to use its energy content as best as it can for its evolution

from one state to another till it settles down to an equilibrium state. If the initial state of the system is said to be in an ordered state its evolved state would be considered as in a disordered state. Consider a drop of milk put in the middle of a tea cup at $t = 0$.

As time passes it spreads slowly with particles of milk executing random walk. After sufficient time, when the entire system approaches equilibrium, the milk particles will be distributed over the entire volume, but completely in a disordered way. Now, however long, we leave this system, it will never return to its original state, with tea and milk separated and milk particles aggregating to form the original drop. The degree of disorder is known by the name Entropy and thus the transition from order to disorder evidenced in the above experiment is termed as the increase of entropy. While this is happening some of the internal energy of the system gets utilized, and thus **the potential energy** of the equilibrium state will be less than that of the initial state. As in this case the system by itself can never get back to the initial state the process is 'irreversible', and has increased Entropy.

The above phenomenon of increasing the entropy of a system is known as due to thermodynamic arrow of time. Similarly one has the Cosmological arrow of time, which deals with the expanding Universe scenario, from the event of the Big Bang, which is considered as the beginning of Time, going forward with the expanding Universe, again indicating the increase of entropy as all matter move away in the form of clusters of galaxies, and continue being so as depicted by the cosmological red shift.

One also distinguishes the Psychological arrow of Time, as it is associated with the perception of an individual, and is purely subjective as it is related to the changes and experiences of the individual. Here again the direction is from past to future for all material bodies. How far can one quantify the comprehension of Time by the Mind? One may argue, that an individual's Mind can transgress this restriction as one can in principle go back in time in his/her mind to recollect the events past, but one cannot relive that experience or alter it to change the history. For matter in bulk, Conscious meaning of Time has to agree with the other two arrows of moving from past to future through the present.

Universe as we see today seems to have had a beginning called the BIG BANG, when all of Space, Time and Matter (Energy) came into existence. With time, the matter started expanding and created Space and the way the processes happened with matter in space and time expressed in terms of Mathematics are, what we call the

LAWS of NATURE

Our present understanding of the Universe, can be extrapolated to the time 10^{-34} secs to the future of the Big bang only. Thus our Laws cannot be called Eternal because we have NO framework to understand how Matter/Energy behaved between time '0' and 10^{-34} secs. Only when we get new evidences and be able to bring the physics into mathematical structure for this period, will one be able to clarify whether the laws that we perceive today as Basic Laws are indeed the laws that govern the Universe for all times! As Time itself is relative, the laws expressed through the history of observations, are bound to be considered as Ever Evolving.

Finally, Mind and Comprehension which perhaps are the two essential elements along with Space, Time and Matter, that feature the knowledge of "Consciousness", need deep analysis, Mathematically, Linguistically and Symbolically from different approaches, in a manner, be it Scientific, or Artistic or Spiritual.

This is just a beginning-One needs to go still very Far!

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<5>. The Elusive Truth

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1.Introduction

The Jaina doctrine of *Anekāntavāda* states that all objects in the universe possess an infinite number of modes (*pariyaya*) of existence which coexist in everything but manifest at different times under different conditions. One may observe a thing or situation from a particular perspective at a particular time but that does not tell everything about it. Each view is only one aspect of it and some of these descriptions may *prima facie* be mutually inconsistent or contradictory, but different views are basically complementary and, all together, give a more wholesome understanding of real nature of the object. This theory has been variously called as non-absolutism, multifacedness, multiplicity, relativism, non equivocality, pluralism, contextuality, non-one sidedness etc.

Syādvāda a corollary of *Anekāntavāda*, emphasizes that every statement is only partly true and must be qualified by its context or perspective. One may visualize a given thing or situation from any one of the stand points (*nyayas*). No description is complete or wholly true and must be qualified by the statement that "it is perhaps like this". The only statement one can, therefore, make with certainty is that no description is certain or complete. Syadavad can thus be called the theory of contextual perspective.

Science is based on the premise that the knowledge about a "thing" can be classified as known and unknown. As the study progresses, unknown is transformed into known, and gradually everything becomes known. In contrast, Jainism classifies knowledge as known, unknown and unknowable (by sensory organs). Combination of these possibilities about an object logically leads to seven (and only seven) modes of its existence termed as *Saptabhangi*: May be it is like this; maybe it is not like this; May be it is like this and yet it is not

entirely like this; May be it is indescribable, May be it is like this and yet it is indescribable, May be it is not like this and is indescribable, May be it is like this, and it is not totally like this and is indescribable. The concept of probability is ingrained in these seven possibilities.

For over a millennia, the Jain logic based on Anekāntavāda, Syādvāda and Saptabhangi provided the foundation of Indian logic, though remained in isolation, till scholars like J.B.S Haldane (1957) and P.C. Mahalanobis (1954, 1957) realized its importance in terms of theory of statistics and probability and D.S. Kothari (1985) found its predictions similar to the quantum theory, in context of wave-particle duality. G.N.Ramachandran (1980,1982,1983), in a series of papers used Syad Nyaya system (SNS) for developing computer logic and worked out a new formulation of Sentential Logic and its isomorphism with Boolean Algebra.

2. Limits of knowledge: The Jaina Theory of uncertainty

The main question is whether everything can be known about everything or knowledge has any limitations. It has been realised, in view of recent discoveries of modern science, that knowledge has severe limitations as discussed in Godel's Incompleteness Theorems which explain limitations of any methodology to understand reality. Godel's incompleteness theorems illustrates our inability to completely understand the truth of nature or reality. In fact there is much in common between Incompleteness theorems developed during the past century and Syadavad, propounded over 2600 years ago. In view of the above discussion, any decision must take into account the multidimensional aspects of nature and hidden, not yet manifested aspects; otherwise it will lead to erroneous results To illustrate the limits of knowledge, we cite two simple examples here. Because of the finite velocity of light and expanding universe, we will never be able to observe or know what lies beyond the horizon, which is defined by the distance light has travelled over the age of the universe. Also as we learn about the brain, this information evolves the brain itself and we will never be able to know the state of brain completely; we can only know the previous state of brain. Consider two other simple cases here : an electron and water. An electron for example has mass, charge, spin, magnetic moment etc. But by observing these properties we can never find out that electron sometimes behaves like a wave. Similarly water has colour, molecular structure, boiling point, freezing point etc. However, it also has other properties because of which it is so critical for all life processes. Simultaneously it has interesting effects on the human body under different circumstances. Hot water is good in winter but cold water is good in summer. Thus

one should understand different aspects of water and one should realize that whenever, one is describing a property of water then due to limitation of language and representation of knowledge and the context, it is not possible to describe all its aspects. The theory of Anekantavad and syadavad have found practical applications in almost all spheres of life such as personal, family and social relations and led to the concepts of tolerance, compromise, forgiveness, and mutual respect for each other's views and is essential for harmonious living. These aspects will not be discussed here and we will confine to the concepts of Jain philosophy in relation to the principle of knowledge, complementarity, quantum mechanics, wave-particle duality, probability and statistics.

2.1 Knowledge and Godel's incompleteness theorems:

We generally feel that mathematical representation of various scientific facts make our knowledge more precise and accurate. However, from the theorems which have been proposed by Kurtz Gödel, we find that mathematical representation of any physical reality limits and actually reduces our knowledge of that reality. Complete knowledge must necessarily have its foundation in an unexpressed, unmanifest field of intelligence.

2.2 Gödel's first incompleteness theorem

This theorem says that the truth of a formalism (which describes any phenomenon) cannot be proved. Thus no finite expression of mathematical knowledge can ever provide a basis for comprehensive knowledge even of the elementary properties of the counting numbers. Thus if one starts with a collection C of symbolic mathematical (or any other) axioms which is specifiable by a finite number of mechanical rules, and if C is consistent, then there will be a true statement about the counting numbers which can not be proved from the axiom C , using the standard rules of mathematical logic. The proof of this theorem shows that from C one can construct a sentence S in the simple mathematical language of elementary number theory whose meaning is : This sentence is not provable from C . Once S is constructed it follows easily that S must be true but not provable from C . Thus on the basis of any finitely specifiable collection of axioms C , one cannot prove all true propositions about the counting numbers.

2.3. Gödel's second incompleteness theorem

A formal language (mathematical or any other) if consistent cannot define its own truth i.e. the definition of truth for a theory must be of a higher order than the theory itself. We can also say that the consistency of any specifiable collection of axioms can never be established on the basis of mathematical arguments which can be justified by these axioms. Thus to establish the validity of any single mathematical system one must necessarily utilize a more comprehensive system, to validate the latter system one has to investigate an even more comprehensive system. These two theorems clearly shows a need for a concept of consciousness which may provide a better description of reality.

2.4 Multi-dimensional nature of reality and interaction among various parts of reality:

All living beings and non-living beings are interconnected (or entangled) among themselves in a highly dynamic way, according to the Jaina theory of mutual dependence aptly described in the sutra *Paraspropgraho jivanam*. The Universe is made of different parts which are influencing each other through complex interactions. Thus in a brain, various thoughts interact among them and one or few thoughts dominate at a given instant. After some other time, some other thoughts dominate one's mind. So decision taken on the basis of first thought may not be meaningful at a later time. Hence as an application of syadavad, a decision taken on the basis of an instantaneous impulse may not give a correct decision. A wise decision is not made on instantaneous thoughts but on the basis of probabilistic thoughts, considering what could happen in future. Such a balanced decision will be more everlasting and fruitful in the long run. In a series of articles, Shamni Shashi Pragnyaji (2014) has discussed this concept in great detail and has applied in various fields.

3.1 Anekantavad as a physical reality

Anekantavad is not merely a philosophical doctrine but a physical reality, giving the correct description of nature of things. In comparison, science gives only a partial description of objects depending on what is being observed and the technique employed for the same. Yet, to understand the principle of *anekantavad* scientifically, we take recourse to quantum physics. As mentioned earlier, it has been shown experimentally that a photon (or electron) sometimes behaves as a solid material particle and sometimes as a wave, similar to the ripples that are created on the surface of water in a pond when a stone is thrown on it. They manifest as a particle or a wave depending on the experiment one sets

up, or essentially what an observer wants to observe. Each experiment, thus, gives only a partial view and all views taken together take us nearer to the real nature of the particle.

3.2 Gross and subatomic worlds:

Quantum physics divides the universe into two parts, the gross (macro) and subtle "micro". The macro world (galaxies, planets, rocks, dust and the objects that can be seen with unaided eyes) are governed by laws of classical physics. Micro-world (atoms, elementary particles etc that cannot be seen without employing a magnifying device (such as an electron microscope) are governed by the laws of quantum mechanics. The laws of classical and quantum mechanics are quite different. The gross matter has only a limited number of properties. For example, things we see around in daily life exhibit only a few properties like weight, volume and shape. Even though the gross matter is made of protons, neutrons, electrons etc, their existence cannot be perceived directly. As we closely examine these subtle entities of matter constituting the micro-world, they exhibit additional properties, such as electric charge, magnetic moment, wave-particle duality etc. The essence of this discussion is that in the domain of elementary particles, as one goes to finer and finer constituents of matter (from atoms, to protons, to quarks, and so on), it exhibits increasingly newer and more complex properties or attributes (quantum states). It is difficult to perceive all of these attributes at any given instant in gross matter, although they coexist all the time. It is not possible to comprehend or quantify all these states at all times, because they manifest differently at different times under different situations. This is the true nature of reality. According to Jain concept of matter, as we go down in size, *paramanu*¹, the smallest particle of matter (which is not the same as an "atom" in modern physics), may have infinite attributes that are impossible to comprehend. This is neither a limitation of the instruments (or the technique employed for measurement) nor a limitation of the experimental prowess or analytical ability of the observer (consciousness), but is due to the inherent nature of things which prevents them to exhibit all their properties simultaneously at any given instant of time. Understanding the true nature of an entity requires consideration of all of its attributes that represent the manifold aspects of its existence (*panyaya*) for a complete description.

A recent development in this context is the Orch-OR theory of Hameroff and Penrose (2014) where they put forward an idea that nature is neither deterministic

nor random but is uncomputable, an idea which is against the concept from artificial intelligence that human understanding is completely computable. It is based on a concept that space-time geometry can have information in spin foams at Planck's level when we talk of quantum gravity. A possibility is there that one can a process of reduction of a quantum superposition state at his level and this reduction is governed by this information, which we cannot control. A similar objective reduction takes place at brain level through what are now known as tubulins, the quantum systems operating within neurons through microtubules. The two objective reductions are related with each other. Again the uncertainty in our knowledge is reflected at very micro level.

3.3 Anekantavad and the principle of Complementarity:

Scientifically, the closest approach to understand *anekantavad* is by the "principle of complementarity", which is the cornerstone of modern physics. Neils Bohr, who propounded the basic principles of quantum mechanics, had difficulty in explaining the behaviour of certain particles in the micro- world, particularly the observed phenomenon of particle-wave duality, which apparently seemed contradictory to common sense since it was presumed that a photon or an electron, a material particle can not be a wave, which is only a vibration. The two are fundamentally different. An entity can be one or the other but not both. Bohr explained this seemingly contradictory behaviour by stating that the two are actually complementary aspect of their true nature. He used the Chinese concept of Yin and Yang, which have opposite characteristics (color, orientation, eyes etc of the fishes) but coexist and both together represent the whole. *Anekantavad* goes a step further and states that is not just the duality (such as particle and wave nature of the elementary particles) which needs to be explained but many (*anek*) or even infinite modes of behaviour that are manifested when one goes to more subtle, smaller constituents of matter, ultimately to the level of indivisible *paramanu*.

Anekanta not only accommodates but takes a synergetic view between seemingly contradictory propositions in several aspects of micro- world, mental perception as also in the spiritual domain. It also leads to the concept of *avyakta* or inexpressibility of certain states. Science has progressed on the assumption that everything is logical and expressible and does not permit inexpressibility of any characteristics. In contrast *anekanta* emphasizes that some of the aspects are indescribable or inexpressible. Questions which cannot be answered unambiguously, either in the affirmative or negative, such as the

existence of soul, can be dealt with in the framework of inexpressibility. In essence, *Anekanta* is a multi-view perception which does not arise due to limitations of consciousness to perceive all the aspects of the physical world completely, but represents the true nature of things.

Anekantavad has many corollaries for its practical application and we discuss two of them, *syadavad* and *saptabhangi* here.

In a very recent study, Moxi Shah (2014) has further extended the ideas of quantum mechanical theories of causality, complementarity and uncertainty and compared them with the three theories of Jainism such as *karmavāda*, *anekāntavāda* and *syādvāda* respectively?. She has compared the theory of causality with karmavada, complementarity with anekantavada and uncertainty with syadvada and tried to analyze the problems encountered in the field of quantum mechanics and Jainism and found similarity in these fields.

4. Anekantvada, Syadvad² and contextual relevance:

Syadavad is based on the concept that nature is a multi-layered system and is a consequence of the fact that part of the truth (property) invariably remains latent and thus indescribable. In other words, one can state that all aspects of reality are contextual and there is no unique, absolute, complete truth and some element of truth exists as latent in every realization (or proposition) of reality. One may be closer to the truth when one qualifies a particular perspective by saying that perhaps this perspective too may be correct. It does not mean any doubt, confusion, ambiguity, or uncertainty but makes our understanding as certain as it can be. Since all propositions are contextual, the only statement one can make with certainty is that no proposition is absolutely certain. This is the way one can define *syadavad* or the Jain Principle of Uncertainty, which of course is different from the Heisenberg's Principle of Uncertainty in physics.

Syadvad states that the knowledge about a "thing" depends on the perspective of the observer. Perspective of a thing depends on the mental "frame" (of reference) of the observer. The same observer can have different perspectives at different times, depending on the state of his mind.

5. Saptabhangi, wave- particle Duality and contributions of D.S.Kothari

The existence of these seven states of elementary particles can be demonstrated

by the phenomenon of particle-wave duality exhibited by an elementary particle (say an electron) at a particular instant. Both *Saptabhangi* and quantum mechanics are characterized by seven possibilities, viz. it is a particle; it is a wave; it is a particle and yet it is not just a particle (indeterminable); it is a wave and yet it is not just a wave (indeterminable); it is neither a particle nor a wave; it is both, a particle and wave; and its state is indeterminate ??. This has been succinctly explained by Dr. D.S. Kothari in terms of quantum mechanics in his essay on “Complementarily principle and Eastern philosophy” through the example of a particle in a box which is divided into two compartments (A and B) by a partition with a hole in it. In accordance with the particle-wave duality, the particle (say, a photon or an electron) can either be in compartment A, or in compartment B, in A and still not only in A, in B and still not only in B, neither in A nor in B but somewhere else (outside the box), in A as well as in B and in an indeterminate state (*avyakta*). The same scenario emerges from quantum mechanical considerations, as has been shown mathematically by considering wave functions that describe the behavior of the particle.

Thus in the case of an electron behaving as wave as well as particle, one can think of following possibilities (Kothari D. S.):

- May be Electron is a wave.
- May be Electron is not a wave (but a particle).
- May be Electron is both a wave (and a particle).
- May be Electron is indeterminate.
- May be Electron is a wave and is indeterminate.
- May be Electron is not a wave and is indeterminate.

May be Electron is wave, and is not wave (particle) and is not determinate.

Thus *saptabhangi* introduces the concept of indescribability (*avyakta*) which states that some of these seven states are indeterminate. This concept of *avyakta* is scientifically somewhat intriguing as it means an indeterminate, indescribable or unmanifested state.

6. Syadvad and Logic

Thus there is clear limitation of knowledge. Though the unknowable can be experienced, it can not be described. Language is incapable of describing it and this knowledge is beyond logic.

G.N. Ramamchandran, tried to formulate it in form of Boolean Algebra. Ramachandran, (1981;1982a,b.) We discuss a few paradoxes here which were known to the Greek philosophers and known by their names. A solution to these paradoxes can be found within the framework of Saptabhangi.

6.1 Resolution of paradoxes

Many paradoxes can be understood in terms of saptabhangi. We just illustrate it with the case of Cretan Liars paradox. The "A man says that he always tells a lie. what he said is true or false?" One can not answer it without contradicting the man's statement. See the following example also, where one starts with "x is not true" and one concludes that "x is true"

• Suppose: 1. $x = \text{"x is not true"}$ Then: 2. x is true if and only if "x is not true" is true And: 3. x is true if and only if x is not true Therefore: 4. It is not true that $x = \text{"x is not true"}$ (QED)

By using the options given by saptabahangi, it can be said that either it can be true or it can be false or it can be indescribable and other combinations thereof given by the seven possibilities described above.

1. In spite of the same name, the Jain *paramanu* which is dimensionless is not the same as the *paramanu* (atom) described in modern physics .

2. In a nutshell, *Anekantavada* emphasizes that this is true (but only partially) and that also is true. Contrasting it with the *upanishadic* concept of *neti*, the existence of God in every conceivable manner and mention it in the negative "Neti , Neti", implying (that God is) neither this, nor that. In fact, none of the visible objects is God. In contrast, *Anekantavad* says in the affirmative "This is true and that also is true". Upanishads look at Logic does not have just two answers to a problem, Yes and No, as can be illustrated by several paradoxes. As we shall see below, some answers can be yes and no, both, some answers can be contradictory and some answers can be Indeterminate. This is what exactly syadvada predicts.

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**<6>. General Systems Theory , Quantum Physics, Theory of Relativity
and Neurophysiology and concepts of Jainism may provide new
concepts of knowledge and evolution**

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ABSTRACT

This paper summarizes limitations of scientific methodology and the concept of knowledge used to study living systems including human systems. It includes limitations caused by the Godel's incompleteness theorems and conservations laws defined for isolated closed systems. It is suggested that we need to explore the General Systems Theory (GST) for better understanding of these issues. It is shown that the concept of Jainism that knowledge is structured in the consciousness needs to be examined in the modern context. It is also illustrated that scientific knowledge is just a subset of a much wider concept of knowledge which is structured in the consciousness.

Therefore research on consciousness may provide new frontiers of knowledge not yet recognized in the modern science. Some recent studies to understand consciousness using quantum physics, general theory of relativity, finer structures of neurons like microtubules and tubulins is also discussed as they may show that these new ideas will further support Jains concept of consciousness. In particular it may support the idea from Jainism that knowledge is structured in the consciousness. As a consequence of this, it is also mentioned that Darwin's principle of "Survival of the fittest" should be compared to a wider principle "Live and Let Live" of Jains based on the higher dimensions of knowledge which emphasize more on underlying identify among all living beings than differences among them. Some examples of extra sensory perception are given from my personal experience. Finally it is proposed that the process of enlightenment as described in Jainism to achieve the highest state of soul may be accompanied by a reduction in rate of entropy increase and a decrease in resource consumption at every stage.

1. INTRODUCTION

Science and technology and their use in economic developments and

commercialization have revolutionized the whole world in such a way that everything appears to have changed in last century. Developments in the field of space technology, atomic energy, electronics, biotechnology, modern agriculture, telecommunication, and manufacturing industries are some of the examples of these changes. These changes also have played a key role in making this world truly global. However, they have also resulted in an increase in population, depletion of natural resources, damage to the environment, increase in terrorism, threats of nuclear wars and so on. However, all these consequences have resulted in a large scale increase in entropy in the world at different levels in different fields (Pokharna 2012). In addition, because of these changes and domination of science and technology in all walks of life, an impression has been created that scientific knowledge is the supreme and anything other, which does not fall into this domain is not very relevant. But the modern science and technology are just two hundred years old and there was a concept of knowledge and technology even before the modern science dominated era came into the existence.

Actually one finds that scientific methods developed to study the physical systems are not adequate when biological and human systems are also included (John Gigch, 1978, Bertalanffy, 1976), because all living systems are essentially irreversible in nature, that is they grow and decay and they are open systems compared to the physical systems which are closed systems. Furthermore there are micro controls in the form of thought processes which cannot be easily adjusted in any planned "scientific experiment". Also they have a property of infinite amplification because of the thought processes, which makes it difficult to make them study in a strictly scientific way. Also any type of experimentation is not possible in case of human systems (Goldsmith 1990; Jones 1990), as they have memory, free will, creativity, tendency to interact strongly with other fellow beings and the environment. So the biological and social systems cannot be strictly subjected to the process of measurement and hence they are not exactly describable in the strict terminology of the physical sciences. Expressed in a different way, it is now felt that the standard concepts used in any scientific study like compartmentalization, reductionism, causality, mechanism, induction, empiricism and passivism etc. (Goldsmith, 1990, Jones 1990) cannot be used to a strict study of the biological and social systems. Not only this, but the basic parameters used in science like energy, mass, linear momentum and angular momentum which are basically defined for closed isolated physical systems, may not be the best choice for describing the biological and social systems (Penrose, 1990 and John Gigch 1978, Pokharna 2012). The final blow to limitations of scientific methodology is being done by Godel's incompleteness theorems (Penrose, 1990) which have virtually shaken the foundation of modern science. Therefore a totally new

perspective and new concepts are required to handle the modern problems of the society.

In view of these issues, it is observed that most of the development in science and technology and their economic exploitations have resulted in a large increase in the entropy at all levels starting from the human brain to the whole biosphere.

Hence General Systems Theory (GST) is used for better understanding of the whole problem because by its intrinsic nature, GST can give a better picture of the interconnectedness of various components of the Human-Earth-atmosphere-universe system. It is finally a problem of order versus disorder (Pokharna, 1985, Pokharna 1991, Pokharna 1996 and Pokharna 2006, Pokharna 2010 and 2012) at all levels and so when we talk of development and evolution, we should talk about the development of the order and evolution of the order for complete understanding of the term development. These concepts will have significant impact on all the problems of the modern life. Hence the concept of “order” as defined in the case of General Systems Theory needs to be closely examined in view of irreversibility of the biological and human systems. Therefore it is proposed that the Jain concept of evolution of consciousness might be closely related with some kind of knowledge and order at different levels.

This may inspire the scientific community to take up the concept of consciousness seriously, because its evolution might directly lead even to new concepts of development. It is shown that spiritual processes mentioned in Jain philosophy could provide new direction for development of concepts of knowledge and evolution which may be accompanied by a reduction in entropy production in the brain as well as in the society and the atmosphere (Pokharna 2012).

It appears that it is necessary to explore the concept of consciousness for better handling of the current problems and its connection with knowledge. It is here that the concept of knowledge as enunciated in Indian philosophy in general and Jainism in particular needs to be considered. This paper emphasizes that scientific knowledge has limitations and there is knowledge beyond science, which may include knowledge of the consciousness also. The Jain concept of knowledge, with five different types, needs to be further explored in view of modern concepts of knowledge in computer science and the neurosciences.

There is another dimension of this problem dealing with development and evolution. Presently, the concept of development is governed by economics whereas Darwin principle is important for evolution. However, in Indian

philosophy, and Jainism in particular, there is emphasis on spiritual evolution which essentially depends on evolution of consciousness. In view of several problems faced by the modern world, there is a need to have an extensive comparison between these two types of evolution so that some better model of evolution and direction of development can be evolved.

Quantum physics has been extensively used to understand consciousness (Appendix 1). In Appendix 2, implicate order of quantum physics is compared with Jain concept of keval jnana. Appendix 3 discusses possibility that consciousness can be an entity for which causality is neither obeyed nor violated. In recent past, extensive work has been done to understand the concept of consciousness through psychology, philosophy, neurophysiology, medical science, artificial intelligence, mathematics, computer science, quantum physics and general theory of relativity (Appendix 4) etc. The work of Penrose and Hameroff about finer structure of neurons in terms of microtubules and tubulins, which may follow quantum gravity are discussed. We also discuss the possibility of information being present at Planck's level in space-time geometry, which may imply soul like concepts mentioned in Jainism. Even theory of karma, *paap* and *punya* and rebirth can be explained using this information contained at Planck's level. They lead one to infer that there can exist higher dimensions of knowledge including Extra Sensory Perception (ESP). Actually it appears that the recent development in the field of quantum computers and quantum information may enable us to distinguish classical information from quantum information, like *Paroksh Jnana* and *Pratyksha Jnana*. It is suggested that possibility of quantum computers through tubulins in the brain and possibility of information being stored in the space-time geometry may confirm the Jain theory that knowledge is structured in the consciousness.

2. SCIENCE, TECHNOLOGY, ECONOMIC DEVELOPMENT AND ENTROPY:

We now discuss the consequences of a unidirectional concept of economic development and its modifications due to science and technology, which have destroyed the environment and is degrading the life support system irreparably. Actually economic development is required for smooth running of a society and everybody wants it. However, with the advancements of science and technology, industrial revolution has taken place in the world. Due to this economic activities started concentrating at a few places and in a few cities. Their activities started polluting the natural resources in a highly damaging way. The whole process of

polluting the environment can be traced to these increased industrial activities and increase in population due to decrease in the death rates. Due to congestion of the cities, there results a cut throat competition among people for survival. The old value system based on simplicity, honesty and sincerity started getting replaced by complexity, consumerism, dishonesty, and unwanted domination of certain groups and countries over others. It has also resulted into a large scale corruption in many places in the world. The emphasis on economic development has become so much so that all other types of developments have been set aside. Thus women in many countries who used to work towards spiritual evolution, religious activities and family welfare, have all started working for economic development only. Also indices based on economic growth are dominating the people's mind that impact of economic development on environment is totally ignored.

Effectively one can say that final consequences of these activities have resulted in a very large increase in the entropy (disorder) of the environment and the society. Some examples are given below where one finds ideas of entropy increase in one way or the other.

- (a). Mixing of hydrocarbons like petrol and diesel vapor with air and water etc. which were otherwise distinctly separate.
- (b). Spread of industrial chemicals and other pollutants in rivers and ponds.
- © . Flow of millions of tons of fertile soil in the sea every year.
- ©. Adulteration of food and medicines and many industrial products.
- (d). Spread of electromagnetic pollutions in atmosphere due to very large increase in use of mobiles, internet and other electronic gadgets.
- (e). Decrease in orderliness in music and increase in noise.
- (f). Mixing of roles of men and women.
- (g). Increase in corruption and black money due to which unaccounted money is diverted from main economy to areas and accounts which are not counted in GDP and so on.

Creation of the so called non-biological ordered systems (say concrete jungles, industries, machines which do not carry any form of life) in the name of economic development has basically led to increase of entropy in the biosphere. Such ordered systems can be called as "Non-biological ordered material systems" generating large entropy in the atmosphere. To understand the root cause of these problems, one has to closely examine the basic laws of science and find out whether this type of analysis can provide better alternatives and new directions of

development. The situation is so bad that just only six years are now left for permanent irreversible processes to set on Earth. They will be disastrous for the coming generations.

3. LIMITATION OF THE SCIENTIFIC METHODOLOGY

In all scientific experiments, one measures a small set of parameters and then correlate them to get some relations, which turn out to be some rules and laws. Thus in Newton's laws of motion, one defines mass and acceleration of a particle and then relation is developed between the two. However, let us look at a little more complex system where the problems come into the picture and where interaction with other parameters come into the existence more clearly. Thus when high yielding crop varieties were introduced in the country, the experiments are conducted in small plots by selecting those varieties and confirming the claims that they give higher yields. These results are then recommended for large areas, which has happened in Punjab and other parts of the country. Now over years, this has ultimately resulted into degradation of the soil on a large scale and depletion of the ground water in Punjab. This has happened because while conducting the experiments (laboratory scale), such long term consequences are not looked upon. Means some parameters like extra use of water and increasing use of fertilizer and pesticides in the future is not taken into account. These factors then become important when large scale extension is made in long run. Another example is use of mobile telephone. Here again what science does is to prove (?) that one can receive signal from a distance through electromagnetic wave and so one can communicate with others sitting at large distances through emails and telephones etc. However, while doing those studies, the effect of use of mobiles on human memory is not carried out. A common complaint these days is that with the use of mobiles, one's own memory is decreasing. So again here also some parameters are not taken into account while conducting an "experiment". These new factors come into picture later and virtually become uncontrollable, when there is large scale generalization of the "experimental observations" outside the laboratory and into the field and an uncontrollable expansion of the "experimental observations in the interests of the public". There is a need now to closely examine these "benefits of science" to the society in general.

3.1 . Limitations of scientific methodology due to conservations laws:

Any phenomenon is called scientific if it can be verified in a laboratory under given set of controlled conditions and is reproducible at any point of time and at any place. This condition is called space-time invariance. In addition, we define

conservation laws in physics which are foundation of all scientific measurements. Thus we have conservation laws for energy, linear momentum, angular momentum etc. Now all these conservation laws are defined for isolated closed systems, thus approximating the nature. Thus energy is defined as that variable of a closed isolated system which does not change over time. But in nature, we can never have a completely closed isolated system. Similarly linear momentum is defined as that property of a closed isolated system which remains invariant with any spatial displacement and so on. Hence the mere definitions of conservation laws are not perfect because they first divide the world and then try to define it. The interaction among these systems is then studied by considering the nature and magnitude of the interaction among them.

3.2 Gödel's incompleteness theorems

The most attractive aspect of scientific knowledge is its mathematical basis. We generally feel that this mathematical representation of various scientific facts makes our knowledge more precise and accurate. However, from the following theorems which have been put forward by the great mathematician Kurtz Gödel, we find that any mathematical representation of any physical reality limits our knowledge of that reality. Not only has this but the theorem also implied that none of the languages or representation can express the reality of nature with perfection. Complete knowledge must necessarily have its foundation in an unexpressed, unmanifest field of intelligence. Let us begin with the theorems. (For details, see the article by Bhandari and Pokharna in this volume on Anekantvada and Syadvada)

3.3 Physical systems versus living systems and the General Systems Theory

For biological systems which are so strongly interacting with each other, interactions can be more important than the individual qualities of the systems. In fact these individual qualities are constantly changing with time due to interactions at different levels. Thus for example, one cannot label a person as a good or bad from certain point of view, because he may be very good from another point of view. In addition, he or she may just change in very short time due to interaction with other persons or some situation. Also all living beings are essentially irreversible in nature, that is they grow and decay and they are also open systems compared to the physical systems (which are treated as closed systems, with some approximation). They constantly interact with the environment like, human beings takes oxygen from atmosphere and releases carbon di-oxide. In addition, human systems have memory which makes it impossible to do any scientific

experimentation on them. Now this type of experimentation is not possible in case of human systems because as shown above human system has memory, free will, creativity, tendency to interact strongly with other fellow beings and the environment. Furthermore there are micro controls in the form of thought processes which cannot be easily adjusted in any planned "scientific experiment". Hence biological and social systems cannot be subjected to the strict process of physical measurement and hence they are not exactly describable in the strict terminology of the physical, sciences. Therefore such systems are studied in a different way by using statistical procedures. In such methods only some rough trends or patterns are found.

Hence to handle all the above problems, we look for a new discipline called General Systems Theory (GST, John Gigch, 1978). It has been developed to handle such complex systems and their properties. Different sets of rules are there to describe and understand such systems. As per this theory, all systems are characterized by transfer of information. Here knowledge and order (entropy) are more important compared to any other attribute, such as energy.

Hence, under this discipline, pure physical sciences are now categorized as hard systems and subjects like sociology, religion, psychology, biology etc are classified as soft systems. It is observed that even religion also falls in this domain as some type of system in which there is information and knowledge transfer going on continuously. Thus religion and science can be put together in this formalism.

3.4 Darwin's principle of "Survival of Fittest" vs Jain's principle of "Live and Let Live"

There is another field of science where limitations of scientific knowledge is reflected in a somewhat different way. It is the process of evolution of Darwin's and, which can be compared with the evolution of consciousness described in Jainism.

As we know this principle is based on the rule of natural selection and was brought into lime light by Charles Darwin. An assumption is made that all life emerged from slow evolution from a single ancestor. The basic idea of his hypothesis is that due to limitation on resources, various species of living world struggle for survival. Those which have slightly superior functionality will survive and others which do not have these additional functionalities will be eliminated but the whole process is very slow. Hence those who can adjust with the change in time, survives and others are eliminated. This is therefore being described in short by a well know saying that is "the survival of the fittest. This principle was

enunciated by Darwin about 150 years ago. At that time there was no genetics. With this new development, the same principle was termed as Neo Darwinism. Under this name natural selections at genetic level is considered during mutation and those genes are selected which are superior in functionalities. (Wikipedia)

Darwin also talks of evolution of human beings and mammals and observes that all humans have striking similarities with apes and hence humans evolve from apes through natural selection in very slow processes over long time. He observes that there are no goals or directions for species to evolve, say like for highly developed species like human beings and animals, which might be partly determined by value system prevalent in the society. etc. However, Darwin's ideas are based on analysis of past data and develop correlations among them to establish his hypothesis. But there are no goals for species. They only look at nearby future and attempts to survive. (Wikipedia). At this juncture, it is also necessary to understand the important role of education of The Darwin's principle of evolution on the society and the environment. Goldsmith (1990) feels that it is due to too much emphasis of the education of this Darwin's principle of evolution that so much damage has been done to the environment. Dennet (1995) has written a book whose title is Darwin's Dangerous Idea: Evolution and the Meanings of Life", put lot of emphasis on designing of morality, the risk involved with the Darwin's principle of evolution and its education. In view of this situation, there is a need to examine the Indian principle of evolution of soul in some details. Hence it is necessary to study the Jain's principle of evolution which is characterized by the principle of "Live and Let Live" and it emphasizes on recognizing the underlying identity among all living beings.

3.5 Human understanding is neither deterministic nor random but is Non-computational

Another interesting consequences of this development is the proposal that human understanding is neither deterministic nor random but is Non-computable, and contradicts the concept used in artificial intelligence that human understanding is completely computable. It presupposes that space-time geometry can have information in spin foams at Planck's level when we consider quantum gravity. Reduction of quantum superposition at this level is governed by this information, which we cannot control. A similar objective reduction occurs at brain level through "tubulins", the quantum systems operating within neurons through microtubules.

3.6 Process of measurement in quantum mechanics takes away information

As is well known, all quantum mechanical systems have several Eigen states and after a measurement, the system collapses into one of the Eigen state. The probability of finding any of the Eigen state is determined by the Schrodinger equation. Since the process of measurement results into just one Eigen state only, information about other Eigen states is lost due to the process of measurement. Hence again, it is impossible to get complete information about a quantum mechanical system. These days, the wavefunction is therefore known as a “wavefunction of ignorance” . Here again we see limitations of scientific knowledge.

4. NEED TO REALIZE THAT SCIENTIFIC KNOWLEDGE IS ONLY A SUBSET OF THE TOTAL KNOWLEDGE SYSTEM AND ACTUAL KNOWLEDGE MIGHT BE STRUCTURED IN THE CONSCIOUSNESS:

These examples show that knowledge can be structured in the consciousness. Even the scientific knowledge is based on interpretation of the scientific experiments which are ultimately interpreted by the human consciousness. With the advent of science and technology, a misunderstanding and misconception has developed among the masses that the scientific knowledge is the only ultimate knowledge in the world. Not only this, it also presumed that the knowledge which is experimentally verifiable and repeatable at any place and at any time alone is the actual knowledge. This is far from the truth. The fact is that the so called science is just around 200 years old and the concept of knowledge existed much before that for several centuries. *Vedas, Upnishads, Purañās, Agamas, Mahabharat and Ramayana, Koran, Bible* have lot of knowledge about life and controls to be followed. Similarly technology of gold manufacturing in the ancient India, design of old temples etc involve knowledge, which need not be scientific. People working in the files of art, culture and sports have several different type of skill and knowledge, which need not be scientific. Actually the recent developments in computer science and neurobiology clearly show that knowledge is nothing but information organized in some way (Goldsmith 1990) and information in turn is just organization of data in some fashion. It is also realized that human consciousness (and even animal consciousness) is capable of organizing these data and can generate information and hence knowledge in some way. Therefore what we call as scientific knowledge is just a subset of this grand concept of knowledge, which can exist in the human consciousness. Because all interpretations of all

scientific experiments are ultimately done by the human consciousness

5. CONSCIOUSNESS AND ITS EVOLUTION SHOULD BE A FUNDAMENTAL ELEMENT OF ANY NEW PARADIGM OF TOTAL SYSTEMS APPROACH TO DEAL WITH THE MODERN PROBLEMS:

As order seems to be the most critical factor in the process of development and also order in the brain is most critical which will influence all other type of orders, Also since knowledge is another crucial concept associated with the brain or consciousness, it is equally important to understand the concept of knowledge associated with brain and consciousness along with the order in relation with knowledge and consciousness. The concept of consciousness is described in biology, psychology, neurobiology and quantum mechanics also. In addition, several experimental studies have been carried out to recognize various states of consciousness like sleeping, waking and dreaming stages. A fourth state of consciousness is well established now (Meditation). Many more such studies are required in this direction as Indian *yogis* and *rishies* talk of several higher stages of consciousness.

Philosophically, several Indian schools of thought also talk of consciousness and its evolution. They basically assume that knowledge is structured in the consciousness. Most of the Indian philosophies believe that actual knowledge is structured in the consciousness. Thus for example in Jainism, a pure soul has infinite knowledge, infinite intuition, infinite bliss and infinite power. Although perfect soul has other characteristics but the knowledge has been regarded as the chief characteristic of soul. It is stated in *shastras* that although from the empirical point of view there is a difference between soul and knowledge yet from the transcendental point of view it is sufficient to say that soul is knower and nothing else. So essentially, there is no difference between the knower and his knowledge. It is further argued that this infinite knowledge gets restricted due to the attachment of the soul with material particles, known as karmas. These karmas are attached with the soul from an infinite past. They can be slowly removed through spiritual practices, which may take several births. A state of highest orderliness is defined as a pure soul, towards which, everyone has to evolve. The path of evolution of soul in Jainism is described through fourteen stages, through which one has to pass through before getting liberalized, that is becoming a pure soul from an impure soul by eliminating all material particles known as karmas. It may be noted that this concept is compatible with GST (where definite goals are defined). Here the goal is to get a *moksha* that is to acquire a pure soul.

Also one finds that in Indian context this evolution of consciousness is closely related with practices which are carried out while living with nature and hence persons deeply involved in such pursuits are very close to nature, so they are strongly helping in preserving the environment (Maharishi Arbindo 2011). This must be recognized in view of the serious threat to the environment caused by uncontrolled materialistic developments. Such ideas of spiritual evolution should be also examined while talking about development.

5.1. Difference between soul and consciousness

Soul and consciousness are two different entities. Consciousness is defined to be a property of all living beings and is not present in non-living bodies. It is due to consciousness (*chetna* in Hindi) that living beings are aware or conscious about themselves and their surroundings. It is also responsible for phenomenal experiences, feelings, self-awareness, control of actions, a model of the world etc. Now a days it is linked with some properties of brain like neurons, synapses and their interconnections which somehow results into consciousness and can be termed as awareness to differentiate it from soul (*aatman*).

On the other hand in western as well as Eastern philosophy, consciousness (*aatman*) is assumed to be caused due to a non-physical entity termed as soul. As per the eastern philosophy in general and Indian philosophy in particular (Hinduism, Jainism and Buddhism), soul exists even before one's birth and survives even after one's death. This cycle of birth and death is continuing from the infinite past and will continue in the infinite future unless this process is checked through spiritual practices and thence one's soul is liberated from these cycles of deaths and births. There also exist a concept that there is a universal consciousness which exist among all living beings and pervades the whole universe like ether. However, there are many variations of these theories. Thus there is a dualistic hypothesis as per which soul and matter are two different entities. But in such formulations, it is not clearly understandable why then these two interact and how does one influence the other (either soul influencing matter or matter influencing the soul). As per the other hypothesis, there is only one supreme entity but appear to be two because of our ignorance. The modern science takes the second view known as reductionist view, as per which consciousness can be explained as a result of complex interaction of neurons, synapses and their sub parts and is a result of continuous evolution of the biological structures and processes in order to survive under all odds.

6. SCIENTIFIC DEVELOPMENTS REGARDING CONSCIOUSNESS AND SOUL:

Scientific developments can be categorized in different ways as per the disciplines in which scientists are working. Thus in the field of brain sciences, discoveries of neurons and synapses and their interactions in cortex and thalamus regions have strongly indicated that consciousness (physiological in particular) has strong connections with the processes going on in these regions and flow of information through electrochemical impulses. It is now almost well established that the coherent waves of 40-80 Hz cycles per second known as Gamma waves and found in the EEG (Electroencephalogram) patterns of the brain are strongly correlated with consciousness. When awareness or consciousness is more say during yoga and meditation for example, then coherence is more in these waves. It is also found that hundreds of neurons combine through synapses and axons to form hyper neurons or Hebbian networks and these play extremely important role in the activities related with consciousness. (Hameroff 2011)

Several abstract approaches are also being developed in the field of artificial intelligence, computer science, neurophysiology, psychology, philosophy and robotics to understand consciousness. (See Appendix 4 for a summary of the recent work done towards consciousness which were presented in an international conference on consciousness organized by the Centre for study of consciousness at Arizona University in US and held in Arizona from April 21-26, 2014). It may be noted that western scholars use the term consciousness for soul also. Actually consciousness is equivalent to *Chetna* in Hindi whereas soul is equivalent to *Aatman* in Indian philosophy. Hence the meaning should be kept in mind while looking at the context.

6.1.Simple Models of consciousness and their limitations

All human beings have multiple options for taking any decision in any field and there are always choices available through what is known as free will. There is another property of the brain and it is memory which is holographic in nature that is, it is not localized but is non-local. There is another area, where non-locality can play an important role, it is binding of sense of colour, shape and motion of an object whose corresponding "regions" in the visual cortex are located in different regions and are also processed in different times. This is called a binding problem.

It is worth mentioning some experimental observations by psychologists which clearly shows that conscious actions (responses) precede (in advance) the conscious perception of stimuli by 100-500 milliseconds (Hameroff 2011). Thus in

game of tennis, specific movements to return a fast-moving ball precede conscious identification of ball location and trajectory.

6.2. Exploring use of Quantum physics, General Theory of Relativity and Neurophysiology to understand consciousness

Hence Possibility of using quantum physics for consciousness was explored from the discovery that light and electrons behave both like wave as well particle and there is an inbuilt uncertainty about the outcome which is determined by the experimental set up, which in turn is determined by the state of human consciousness. Thus light shows wave like properties when we talk of its interference and diffraction and shows particle like behavior in a laser beam or in the process of photosynthesis. In general quantum systems can exist in many possible states (known as Eigen states), but when we try to perform a measurement then it shows only one of these possible Eigen states. Quantitatively, one can give only probability of finding the quantum system to show a given state. This is similar to uncertainty in our thinking process, which is ultimately related with our consciousness. (Appendix 1 describes several models developed in these areas).

We have seen above that human memory is holographic in nature that is it not localized and is therefore non-local, which is again a property similar to that of a quantum mechanical system because a wavefunction is always non-local. In addition, quantum physics, we also have a property which is called entanglement, as per which two parts of a quantum system are strongly interrelated like spins of a two electron system. Entanglement can explain the strong interconnectedness, which is a result of association of large parts of neurons and synapses which is not reducible into the properties of individual neurons and synapses.

The property of non-locality can play an important role, in binding of say sense of colour, shape and motion of an object whose corresponding "regions" in the visual cortex are located in different regions and are also processed in different times.

Regarding the processes occurring in the subconscious mind, it is observed that they could be different from those taking place in the conscious mind. There is a speculation that quantum mechanical processes involving even quantum computers are going on in sub-conscious mind. (Hameroff 2011). Memory is stored in the form of "state of a person in certain space at a given time". With each new input, system state change to a new space time coordinate. It explains holographic memory and the space time geometry can lie outside the brain also.(See James

Culbertson: psycho-space in the Appendix 1). In addition, there can be some kind of telepathy and clairvoyance at certain level in the mind, which might have connections with advanced and retarded propagation of waves as per Klein Gordon equations (Appendix 1).

It may be mentioned that quantum physics is now extensively used to understand many phenomena of consciousness which cannot be explained by ordinary computer models and neurophysiology. They try to explain several properties of consciousness, psychological phenomena, parapsychological phenomena and others. Even possibility of backward propagation of signal in negative time direction is explained. Some of these phenomena involving parapsychology are close to Jainism.

6.3. Concept of Objective Reduction and theory of consciousness at Planck's level:

Let us now describe the theory of Objective Reduction, which was proposed by Roger Penrose (1989). This was developed by unifying Relativity Theory and Quantum Theory. He extended Einstein's general theory of relativity, in which matter is essentially space-time curvature, to the Planck scale (10^{-33} cm in length and 10^{-43} seconds in time), which is the most basic level of the universe. Actually, material world is composed of atoms and subatomic particles. But if we go down in scale from atoms, eventually we reach the basement level of reality that is Planck scale geometry at 10^{-33} cm, with coarseness, irregularity, and probably information as well. Descriptions of Planck scale geometry include string theory and loop quantum gravity. String theory, in which Planck scale strings vibrate at specific frequencies correlating with fundamental particles, but this model has some problems. It lacks background geometry, for example, in which the strings vibrate. Another approach is that of loop quantum gravity, which depicts space-time geometry as quantized into volume pixels that is, Planck scale polygons whose edges may be considered as irreducible spin whose lengths also vary but average 10^{-33} cm. Planck volumes evolve and change with time, conveying information as a 3-dimensional spider web of spin. Somehow, space-time geometry is nonlocal, as revealed by entanglement experiments and perhaps holographic.

A particle in one state or location would be a specific curvature in space-time geometry, and the same particle in another location would have curvature in the opposite direction, extending downward to the Planck scale. Superposition of both locations can then be seen as simultaneous curvatures in opposite directions, and hence, according to Penrose, a separation, bubble, or blister in the very fabric of

reality. Penrose has suggested that such space-time separations are unstable and will reduce, or collapse to one particular state or location at a particular time due to an objective threshold intrinsic to the fine structure of the universe, like infinitesimally tiny soap bubbles bursting one facet or another, shaping and creating a new reality. Penrose also suggests that each OR, or self-collapse essentially results in a moment of conscious experience.

This is in direct contradistinction to the Copenhagen interpretation in which consciousness is outside science, externally *causing* reduction by observation. In Penrose concept of OR, consciousness *IS* reduction of a particular type. Thus Penrose OR is the only worldview incorporating consciousness into the universe. Penrose OR differs in another important way from Copenhagen and decoherence in which particular classical states are selected randomly from among superpositioned possibilities. The selections in Penrose OR are not random, but influenced by information embedded in fundamental space-time geometry and graviton like energy level. Partly this model matches the model of consciousness in Jainism where we talk of information being structured in the consciousness. Also Planck's polygons are similar to *Pradeshas* of space and time as mentioned in Jainism.

Penrose suggests another possibility which avoids the need for multiple universes. Values for physical constants defining our universe may be encoded in the fine structure of the universe itself, along with mathematical truth, Platonic values, and precursors of mass, spin, charge, and consciousness. The roots of consciousness may thus extend to the most basic level of the universe. This concept is therefore very similar to the concept of *soul* in Jainism where soul (*aatman*) is assumed to be a fundamental constituent of the Universe and different from matter. Hence a term "Quantum Soul" is coined by Deepak Chopra and Prof. Stuart Hameroff (2011)

6.4. Penrose and Hameroff Model of consciousness developed using Quantum gravity with neurophysiology to explain consciousness at brain level

One of the most popular model these days is that of Roger Penrose and Hameroff, who feel that consciousness (physiological or *chetna*) must be a quantum phenomenon because neurons are too big to account for consciousness. Inside neurons there is a "cytoskeleton", the structure that holds cells together, whose "microtubules" control the function of synapses. They believe that consciousness(*chetna* in the present context) is a manifestation of the quantum cytoskeletal state and its interplay between quantum and classical levels of activity. Actually Penrose has developed a hypothesis known as objective reduction, whose

details are already given earlier. Penrose-Hameroff have further developed a theory known as "Orchestrated objective reduction" ("Orch OR"). They put forwards a hypothesis that consciousness depends on quantum computations in structures called microtubules *inside* brain neurons. Microtubules are cylindrical polymers of the protein "tubulin," and major components of the cell cytoskeleton which self-assembles to configure intracellular architecture, create and regulate synapses, and communicate between membrane structures and genes in the cell nucleus. In addition to bone-like support, microtubules and other cytoskeletal components seem to act as the cell's nervous system, its "on-board computer," continually reshaping and differentiating. Actually these microtubules consist of millions of smaller structures called tubulins, which behave like quantum mechanical systems and they are the candidates for quantum equivalent of "0" and "1" binary digits used in ordinary computers. These are called qubits.

Penrose and Hameroff Orch OR proposes tubulins can be quantum bits, or "qubits" in microtubule quantum computers, and that such quantum computations connect conscious brain functions to the most basic level of the universe. This opens the door to consciousness being nonlocal, and in some cases possibly not exactly connected to the body and the brain. These speculations, are based on ideas in physics put forth by Penrose. Who defined OR as self-collapse of quantum superpositions due to separations in space-time geometry of group of quantum states (generated from tubulins, in this case). Here the crucial parameter is E , the gravitational self-energy of an object $E = (\hbar/2\pi)/t$, separated from itself. Here \hbar , is Planck's constant and t is the time at which OR occurs. E may be calculated based on factors including (1) the object's mass, (2) the level at which the object separates from itself, i.e., shifts of its entire mass, individual atoms, atomic nuclei, or subatomic particles, and (3) the spatial separation distance, how far the object, or its space-time geometry separates from itself. If a superposition of self-energy E evolves and avoids decoherence to reach time t , an OR moment of consciousness occurs.

Because of the inverse relation, the larger the mass and spatial separation E , the briefer the time t at which OR conscious moments occur. Superposition E must avoid decoherence (i.e., the quantum system must be isolated from the classical environment) until time t is reached. Penrose and Hameroff suggest such conditions have evolved in the brain, specifically in microtubules inside brain neurons, and that microtubules perform quantum computations which are "orchestrated" by synaptic inputs and neurophysiology, isolated from decoherence, and terminated by Penrose OR, hence orchestrated objective reduction, that is "Orch OR." This Orch OR is being termed as consciousness. It means that this

transition from quantum reality to classical reality and is called consciousness.

Microtubule quantum superpositions are proposed to extend and entangle from neuron to neuron (through gap junctions), enabling selective brain-wide quantum coherence among microtubules. Actually millions of tubulins from thousands of neurons can collectively oscillate through neurotransmitters and gap junctions and can generate group of several different quantum states, known as a quantum superposition state (not directly observable). Such states are however unstable and reduces to one of the state (which is observable) in certain time which is decided by the gravitational self-energy of say two quantum states of the superposition. Here Orchestrated means well organized group of these tubulins. Decoherence is suggested to be avoided through coherent pumping, actin gelation, ordered water and topological resonances. For details see Hameroff (2007). The author feels that this decoherence might be linked with set of controls at micro level through five *mahavratas* strictly obeyed by Jain *Aacharya* staying in advanced stages of consciousness in higher *Gunasthanas*.

As per Hameroff and Chopra (2006), “Recent evidence suggests that Planck scale information may repeat at increasing scales in space-time geometry, reaching to the scale of biological systems, that is at neural level. The British-German GEO 600 gravity wave detector near Hanover, Germany has consistently recorded fractal-like noise which apparently emanates from Planck scale fluctuations, repeating every few orders of magnitude in size and frequency from Planck length and time (10^{-33} cm; 10^{-43} s) to bio-molecular size and time (10^{-8} cm; 10^{-2} s, Hogan 2008; Chown 2009). The author feels that these various levels may be better described through the General Systems Theory (To be presented in an International conference on quantum consciousness). This is fine scale of the Universe. At some point (or actually at some complex edge, or surface) in this hierarchy of scale, the microscopic quantum world makes transitions to the classical world. If this transition is due to Penrose OR, consciousness occurs as a process on this edge between quantum and classical worlds”. (Hameroff and Chopra, 2006). This notion that consciousness is in some way intrinsic to the universe is comparable to purely subjective views on consciousness mentioned in Jainism and Hinduism. This is particularly true for Jain’s concept of a pure soul, which might have spread over the whole universe and occupy each pradesha of the lokakasha.

7. QUANTUM ENTANGLEMENT, QUANTUM INFORMATION AND METAPHYSICAL PHENOMENA: SOME IDEAS FOR FURTHER EXPLORATION

Quantum entanglement is very important property of a quantum mechanical system. As per Einstein, Podolsky and Rosen (EPR) paradox, if there are two coupled electrons moving away from each other and are with net spin zero then if spin of one electron is measured and is found to be $+1/2$ in certain direction then the other electron will automatically take a $-1/2$ spin value, if measured at some other time. It is now confirmed that this does occur upto a distance of 149 kilo meters. Means the other electron knows (even at a great distance from the first electron) that measurement has taken place on the first electron. To explain such experiments, it is now suggested that quantum information can propagate backward in time. Such properties are also found in some experiments in psychology and they indicate that processes can take place in brain which imply backward propagation of information in time.

7.1. Extrasensory perception: Three examples from my personal life, which shows existence of ESP and beyond measurability through the modern scientific approaches:

These ideas and experiments are again at very preliminary stage, but strongly indicate that processes like telepathy and clairvoyance may exist in living systems. But this is happening at such levels that they need not follow the spatial-temporal invariant conditions of classical physics, due to irreversible characteristic of living systems due to memory.

The first concerns with death of my respected father Shriman Balwant Singhji Sahab Pokharna, who expired on November 30, 2013 in Ahmedabad. However, he was there in Udaipur on November 22 and I rang him on November 22 on phone that I would be coming to Udaipur to take him to Ahmedabad on November 24, 2013. However, he replied that now the time has come for him to go. I became very unhappy and requested him for its meaning. He again emphasized that he will now go from this world. But when I requested him that he should come to Ahmedabad. Then he replied in affirmative and I brought him to Ahmedabad on November 24, 2013 but he expired on November 30 at 05:45 pm. The second example concerns with death of my cousin brother Mukesh Pokharna, who expired in an accident on October 16, 2014 near Udaipur in the early morning around 03:00 am. However, around 06:00 am on the same day, Priyansh Pokharna, aged 15 years, (son of my another cousin brother Prem Pokharna), who got up early that day due to his examination, told his mother that a telephone would come about someone's death. And almost after fifteen minutes, another cousin of mine Mahendra Pokharna rang Prem Pokharna about the death of Mukesh Pokharna.

Prem Pokharna's wife informed about the statement of Priyansh after one hour of the telephone call. Similarly I have one closed relative Shri Mohan Lalji Khaliwal, who expired in Bangalore on January 6, 2010 at around 10:00 am in the morning. However, before one day, he visited a hospital and while returning back, he just dropped down at residence of his close relative Shri Swaroop Chandji Khincha in the evening at around 05:00 pm, in a nearby house. When he visited Shri Khinchaji's family, his (Shri Khinchaji) mother asked Shri Khaliwalji, why in this state of poor health, he had visited their (Shri Khinchaji's) house. ? On this, Shri Khaliwalji told Shri Khincha's mother that "now when else would he come again" (in Rajasthani language). And he expired next day morning. It may be mentioned that Shri Khaliwalji used to visit Shri Khinchaji's house almost every day.

In all these examples, we find that they are all associated with deaths. Two great souls from this list had some pre-conception of their own deaths whereas in the third case, the message was obtained in advance by another relative. The time varies from almost eight days to few minutes. Now such phenomena cannot be repeated again and again as demanded by the methodology of the modern science. But should we ignore them, just because they are not experimentally verifiable and also since they do not fit into the methodology of the modern science. ? Naturally, it required an approach different from the method of modern science and they appear to follow some other rules and laws, which could be quite different from those of the current science. They might involve advanced waves of Klein Gordon equations.

7.2. Classical information, Quantum information versus *Paroksh Jnana (Vidhya)* and *Pratyksha Jnana (Para Vidhya)*

It is now well established that classical information is very different from the quantum information. Thus classical information flows only in positive time direction, whereas quantum information can flow both in positive as well as negative direction. Means backward propagation of quantum information is possible. It also has properties of entanglement that is information at two different spatial and temporal levels can be strongly related with each other as in EPR paradox. Due to this, qubits situated at different places can have strong connectivity resulting into huge capacity to process information and at very high speed. Finally, for a quantum system in a superposition state, if a measurement is carried out to know the state of the system, then, only partial information is obtained (available in the Eigen state into which a superposition state has reduced due to measurement process) whereas some information is lost which was

available in the other Eigen states of the superposition state. As quantum systems are extremely sensitive systems, they are easily disturbed by the so called “decoherent factors” or noise.

In Indian philosophy, two types of knowledge are discussed. They are known as *vidhya* (known as *paroksha jnana* or ordinary knowledge) and *para vidhya* (known as *pratyaksha jnana* or superior knowledge). It appears that *vidhya* may be the classical information of today and the *para vidhya* may be the quantum information. The recent arguments that subconscious mind works on the basis of quantum information (working as a quantum computer), hence it is in agreement with the ancient literature that actual knowledge is hidden from us and is much more than what appears at the observable level. Also one gets classical information from quantum information through the process of objective reduction, hence the ultimate source of information or knowledge could be *para vidhya*

7.3. Concept of rebirth, *Karma* theory, concept of *Paap* and *Punya*

Theory of past *karmas* and that of *pap* and *punya* can be easily explained now since information stored in the space time geometry of a person has records of all the past births and can influence the working of brain at very micro level and similarly the deeds performed in the present birth also leave some information in its space time geometry, which will influence the next births and so on.

India has great spiritual traditions and our *rishi munies* and *aacharyas* have gone into vast details and have practically experienced several dimensions of reality, not yet explored in the modern science. Once the mechanism of information flow between human brain and the space-time geometry is understood properly, theory of *karmas* and *pap punya* will be explored in a more rational way.

7.4. Full awakening of chetna

There is lot of emphasis in Jainism for a need to have a fully awakened chetna (awareness) of oneself to have more and more active information/knowledge at one's command. The current models of brain and consciousness clearly explain this property in terms of larger and larger connectivity among a very large number of neurons and synapses (and hence tubulins also) with minimum noise level (or decoherence). Probably in a fully awakened state, total quantum information is also available at one's command

8. DO SPIRITUAL PROCESSES HELP TO REDUCE ENTROPY PRODUCTION IN THE BIOSPHERE:

From this analysis, we find that Jain *acharyas* and other Indian *Rishies* and *Munies* have spiritually ordered mind and if we look at their behavior and daily practices then we find that they consume minimum resources and hence generate least entropy in the environment. As they go to higher and higher stages of evolution of consciousness, their resources consumptions go on reducing. We feel that the various religious and spiritual practices developed by the ancient Indian seers like *Yoga*, *Meditation*, *Sadhna* and others and they all results into an overall decrease in the rate of entropy production of this biosphere. Although the processes are initiated at an individual level but it expands in the society through the various interlinkages present in the social system. It appears that as the number of persons carrying out these practices increase, the average overall rate of entropy production of this biosphere decreases. In addition this may be accompanied by the appearance of a new kind of order which is being described above and could be linked with an orderly state of consciousness. Therefore there is a need to investigate the different stages of human consciousness which can be in highly ordered states as mentioned in above sections.

9. DISCUSSION AND CONCLUSION:

This paper critically examine the current problems of the society and their reasons of occurrence. It is argued that modern science, technology and their economic exploitations is the main cause of these problems and can be described in the form of an overall increase in the entropy in the biosphere. It is then mentioned that there are stringent limitations of the modern science and true nature of reality can never be understood through purely scientific approaches. Hence, General Systems Theory is suggested to be a better alternative to search for new ways for improved understanding of reality. This approach results into interesting results which imply that the spiritual evolution mentioned in Indian philosophy which talks about knowledge and order as criteria of evolution should be examined in a modern perspective. As consciousness is a critical element in this process of evolution, its concept in the Jainism and the modern science are discussed. The recent researches in the field of modern science like possibility of quantum processes in neurophysiology are highlighted. They indicate that Jain concept of evolution is accompanied by an increase in the knowledge and order and reduction in resources utilization. It is also indicated concepts like rebirth, extra sensory perception and theories of pap and punya will be now treated as new frontiers of the modern science with new perspective about science itself. These ideas are quite preliminary

but are exploratory in nature. In the same perspective, the Darwin's principle of evolution needs to be compared with the evolution of consciousness in Indian philosophy.

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Appendix 1: Models of consciousness developed using quantum physics, theory of relativity and neurophysiology (From Antonella Vannini in *Syntropy* 2007, 1, pp. 130-146). It is just a summary of work done. Only at some places comparison with Jainism is made.

Lotka's hypothesis of mind-brain relation using quantum physics:

Alfred Lotka proposed as early as 1924 when the quantum physics was just born that mind controls the brain by modulating the quantum jumps that would otherwise lead to a completely random existence. The nature of quantum jumps and their characteristics were not known at that time.

Niels Bohr model: consciousness creates reality through the collapse of the

wavefunction

The interpretation of Copenhagen proposed by Niels Bohr and Werner Heisenberg, suggested a direct link between consciousness and Quantum Mechanics. This interpretation attributes to Consciousness an explicit role, through the act of measurement and observation, forcing the wave function to collapse into a particle and determining in this way reality itself. According to Bohr and Heisenberg consciousness would be an imminent property of reality which exists before the creation of reality. This idea is close to Jainism which also believes in soul, an entity different from matter.

Luigi Fantappiè: advanced waves and syntropy–

Fantappiè starts from the d'Alembert operator which in Klein-Gordon's relativistic generalization of Schrödinger's wave equation has two wave solutions: *retarded waves* which diverge from the past to the future and anticipated waves which diverge from the future to the past, and which for us, moving forward in time, correspond to converging waves, attractors/ absorbers (<http://www.sintropia.it/english/2007-eng-1-3.pdf>). Studying the mathematical properties of these waves Fantappiè discovered that the diverging waves are governed by the law of entropy, whereas the converging waves are governed by a symmetrical law, which concentrates energy, produces differentiation, structures and order, and which Fantappiè named syntropy. Fantappiè recognized the properties of the law of syntropy in the living systems, and concluded that living systems are a consequence of anticipated waves. Starting from the mathematical properties of the laws of syntropy and entropy, Fantappiè arrived at the formulation of a model of consciousness based on the following elements:

Free will: which is generally considered a fundamental element of consciousness, is seen as the consequence of a permanent state of choice between information coming from the past and emotions coming from the future

Feeling of life: another basic component of consciousness is, according to Fantappiè, a direct consequence of waves moving backward in time, from the future to the past [anticipation].

Fantappiè says that when physical senses vanish, as in deep meditation, people experience states of consciousness in which past, present and future coexist. The coexistence of past, present and future would be a direct consequence of the coexistence [materialization] of advancing and retarding waves. This idea can

justify the capability of a *Keval Jnani* in Jainism who can perceive past, present and future in once? it is supersensuous state.

Non local memory: Fantappiè suggests the existence of non-local correlations in the universe, as a consequence of advancing waves. For example, in living systems, memory could be a manifestation of non local links with past events which according to Klein-Gordon's equation are still existing. (Also see Wolman, B. B. (1977))

David Bohm: implicate and explicate order

Bohm introduced the concepts of implicate and explicate orders. In the implicate order there is no difference between mind and matter, while in the explicate order mind and matter are separated. When we deal with quantum mechanics the implicate order prevails, but when we deal with classical physics, that is the macroscopic laws, the explicate order prevails. According to Bohm, consciousness coincides with the implicate order. In the implicate order particles take form, through collapse of the wave function, and the implicate order coincides. Therefore with the process of in-formation, taking form. According to Bohm each material particle contains a rudimental form of consciousness. The process of information constitutes a bridge between mental and material properties of particles. At the smallest level of matter i.e. the quantum mechanical level, the mental (conscious){mental is not consciousness as defined by Jainism}and physical processes would coincide. (This model is discussed in the appendix 5)

Evan Walker's Synaptic tunneling model

Evan Walker (1970), argued that electrons can be turned between adjacent neurons, thereby creating a virtual neural network which can actually overlap the real neural network. It is this virtual nervous system that can produce consciousness (According to Jainism consciousness is not created by nervous system.)which can govern the behavior of the real nervous system. The real nervous system operates through synaptic messages whereas the virtual one operates by means of quantum effects of tunneling of electrons (similar to Josephson junction in superconductors) through barriers which are otherwise forbidden by classical physics. So it was argued that although the brain works on the basis of classical physics but consciousness works on the principle of quantum physics.

Exploring the use of Bose-Einstein condensation in biological system to understand consciousness:

Bose-Einstein condensation is a phenomenon predicted for a group of identical atoms having an integral value of spin (known as Bosons) which condense into one single state when the temperature decreases. Here the wave function of all the atoms overlaps and the whole group act as one single unit where the identities of individual atoms disappear and they all merge into a small space. They have lowest possible energy state known “zero point energy” arising due to Heisenberg’s of uncertainty principle. In this situation, the whole is more than the individual parts, effectively losing the individual identities. {The laser is an example of Bose Einstein’s condensation in which all photons have the same energy that is have same frequency. .

Herbert Frohlich (1986) suggested that biological systems can behave like Bose Einstein condensates due to the presence of the so called Biological oscillators which are there in a non-equilibrium state at constant temperature (due to the presence of external source of energy like Sun light). Such biological oscillators are present in all living matter due to the presence of water and biomolecules which have dipoles. These biological oscillators, like a laser, can amplify signals and encode information, generated by some external stimuli.

Umezawa and Ricciardi: Quantum Field Theory (QFT) and Quantum Brain Dynamics(QBD)

In 1967 Luigi Maria Ricciardi and Horoomi Umezawa suggested a model of consciousness base on Quantum Field Theory (QFT). This model starts with the work of Froehlich on Bose-Einstein condensates. The functions of the brain are seen as a consequence of collective quantum order states. For example, memory is associated to “vacuum states”. In QFT vacuum states are the lowest level of energy in which, by definition, no particle is present. The stability of vacuum states make them ideal as a unit of memory. Umezawa and Ricciardi underline that one of the properties of vacuum states is that of developing correlations and order which can extend to the macroscopic level, producing fields which can effect the neural system. According to Umezawa, consciousness would be the result of the sum of quantum processes, while the neural systems would be limited to the transmission of macroscopic signals. This model is somewhat alike the Jain concept of soul and karmas. Thus when all karmas disappear, a pure vacuum state comes which has all knowledge like memory of a ground state. Excitations are just like karmas. For details see Pokharna (1977).

Nick Herbert: pervasive consciousness

According to Herbert, consciousness is a property which pervades all nature, a basic force of the universe. Herbert reaches this conclusion after analyzing the probability principle, the existence of matter (objects are formed only when they are observed) and interconnection (entanglement). These three principles are directly linked to the fundamental characteristics of consciousness: free will, ambiguity and interconnection. Existence of such an entity is similar to the idea of consciousness in Jainism.

James Culbertson: psycho-space

According to Culbertson, memory which is at the basis of consciousness, is a consequence of the change of state of matter in time. In other words, memory is equivalent to different modifications in states of matter in time. From this point of view memory is not formed by data stored in the brain, but by links between different states of space-time, and consciousness would therefore be located outside the brain, in space-time coordinates. In order to describe this concept Culbertson coined the term psycho-space. All objects of nature change their state in time. Therefore, all objects of nature could be endowed with consciousness {which is against *Jainism*}.

Karl Pribram: Holonomic model of mind

Karl Pribram suggested a holographic hypothesis of memory and mind. A hologram is a 3D Photography produced with the use of laser. In order to produce a hologram, the object is first illuminated with a laser light, then a second laser light creates interference pattern with the first one and the interference pattern is stored on the photographic film. When the film is developed only the interference pattern is revealed, but when this pattern is illuminated with a laser light, the original 3D object appears. When the holographic film is split in half and then Illuminated with a laser light, each part shows the original 3D image. Even when the film is divided in minuscule fragments, each fragment will contain the original 3D image. Differently from classical photography, each part of a holographic film contains all the information. According to Pribram, memory is not stored in a specific location of the brain, but works as a hologram. Only the interference among waves is stored. According to this view each information is transformed by the brain in a wave, and all the waves interfere giving place to holograms.

Appendix 2. Implicate Order of Quantum mechanics and Jain concept of *Keval Jnana*:

http://en.wikipedia.org/wiki/Implicate_and_explicate_order

The abstract concept of “Order” was explored by David Bohm, who proposed a cosmological order, radically different from the generally accepted convention, which he expressed to distinguish between the implicate and explicate orders, as described in his book (Bohm 1990).

In proposing this new notion of order, Bohm challenged a number of prevailing fundamental tenets of scientific approach which include the following:

Phenomena are reducible to fundamental particles and laws which describe the behavior of particles, or more generally to any static (i.e. unchanging) entities, whether separate events in space-time, quantum states, or static entities of some other nature.

Human knowledge is mostly confined to mathematical prediction of statistical aggregates of particles.

Analysis or description of any aspect of reality (e.g. quantum theory, speed of light) can be unlimited in its domain of relevance.

The Cartesian coordinate system, or its extension to a curvilinear system, is the deepest concept of underlying order as a basis for analysis and description of the world. That there is ultimately a sustainable distinction between reality and thought, and there is a corresponding distinction between the observer and observed in an experiment or any other situation (other than a distinction between relatively separate entities valid in the sense of explicate order). These are simple assumptions made in our description of reality admitting that our thought and reality are different to some extent.

That it is, in principle, possible to formulate a final notion concerning the nature of reality; e.g. a Theory of Everything.

According to David Bohm, in the enfolded [i.e. implicate] order, space and time are no longer the dominant factors determining the relationships of dependence or independence of different elements. Rather, an entirely different sort of basic connection of elements is possible, from which our ordinary notions of space and time, along with those of separately existent material particles, are abstracted as forms derived from the deeper order. These ordinary notions in fact appear in what is called the "explicate" or "unfolded" order, which is a special and distinguished

form contained within the general totality of all the implicate order (Bohm, 1980).

In Bohm's concept of order, then, primacy is given to the undivided whole, and the implicate order inherent within the whole, rather than in parts of the whole, such as particles, quantum states, and continua. For Bohm, the "whole" encompasses all things, structures, abstractions and processes, including processes that result in (relatively) stable structures as well as those that involve metamorphosis of structures or things. In this view, parts may be entities normally regarded as physical, such as atoms or subatomic particles, but they may also be abstract entities, such as quantum states. Whatever their nature and character, these parts are considered in terms of the whole, and in such terms, they constitute relatively autonomous and independent "sub-totalities". The implication of the view is, therefore, that nothing is entirely separate or autonomous.

This implicate order of quantum mechanics as interpreted by David Bohm appears to be close to the Indian concept of consciousness and the concept of reality in particular. This is also very close to the concept of *Keval Jnana* (absolute knowledge) as described in Jainism that is when one acquires *keval jnana*, all other types of knowledge disappear, and only absolute knowledge is left, which is in agreement with what Bohm is mentioning. Of course this is an indicative first cut similarity between the two concepts and it needs more research.

Appendix 3. Can soul be an entity for which causality is neither obeyed nor violated.

In order to explain, the concept of soul in Indian philosophy, Pokharna (1985) has introduced an abstract entity for which causality is neither obeyed nor violated. This is an entity for which causality is neither obeyed nor violated. The principle of causality implies that for every effect there is at least one definite cause behind it (or a large number of causes behind it) and every effect, in turn becomes a cause of some other effect. In sequence of events, cause must temporally precede the effect. When we say that causality is violated then it can have the following two different meanings : (i) when the causality is violated then this can mean that temporally the role of cause and effect has been reversed so that first we have an effect and then there is a cause. This is the situation believed to be existing in the case of tachyons (particles moving faster than light). They are assumed to be moving backward in time so it is said that causality is violated by tachyons. (ii) Violation of causality can

also mean that there may be some effects (causes) whose causes (effects) may not be known to us or, no physically reasonable causes (effects) can be searched for given effects (causes). This is the situation which we have found in quantum mechanics where there are some uncontrollable fluctuations in the predictability of the state of a system in a given measurement process. These fluctuations are such that we cannot assign any known factors or causes responsible for. Hence this entity is in search of perfect determinism. (The author is very grateful to Prof. B D Josephson and Prof. E C G Sudarshan for appreciating these new ideas).

Appendix 4. Summary of an International conference on consciousness held at University of Arizona

An international conference on consciousness was recently organized by the Centre for Studies on Consciousness of the University of Arizona at Tucson from April 21-26, 2014 (20th Anniversary). The first one in this series was held exactly twenty years ago at the same place and eleven such conferences have been already organized all over the world. The last one was held in Agra (India). Interest among academicians in this field is reflected by the following observations. Around 1000 scientists from 60 countries participated in this conference. Experts were there from various fields like computer science, neuroscience, neurophysiology, anesthesiology, cognitive sciences, cybernetics, schools of medicines, bioengineering, artificial intelligence, physics, quantum biology, quantum computers, relativity theory, naturopathy, philosophy, psychology, religion, arts and many others. Actually no field was left untouched which has any bearing with the problem of soul and consciousness. There were eighteen pre-conference workshops. There were twelve plenary sessions, twenty four concurrent sessions and two poster sessions each having around one hundred and fifty posters each. There were eighteen pre conference workshops also (see below). In all there were 500+ papers presented in this conference. There was also an East-West Forum, to discuss the concept of soul and consciousness in Eastern and Western philosophies.

Indian scientists made tremendous contribution. Deepak Chopra was invited to speak on subjectivity and Objectivity. Anirban Bandyopadhyay spoke on "Quantum Approaches: Twenty years on". DEI East-West Forum was lead from Eastern side by Sriram, S Roy, V Sahni, A K Mukhopadhyay, B D Dhir and P S Satsangi. Around eighty Indian scientists and professionals directly and indirectly participated in this conference, covering almost all topics, but more focus was

there on spiritual dimension. Last but not the least, there is an Indian named Dr. Mani Bhaumik, who gave an award of \$10,000/- for the best paper for this conference. He is a Padam Bhushan awardee and is the originator of exploring the use of excimer laser for the medical use which is now commonly used for lasik surgery for the eyes to correct the vision. The author has also presented a paper indicating a need to explore General System Theory and Indian philosophy for better understanding of the issue of consciousness and soul. See the following link for details

<https://sbs.arizona.edu/project/consciousness/abstract.php>

<7>. Quantum Field Theory like model of consciousness in Jainism.

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Abstract:

Jainism [[1] and Appendix 1], is one of the major three religious systems of India. It is well known for its rational and a scientific methodology. Here their theory of karmas is presented which describe interrelation between soul and matter. They talk about a pure soul which has infinite intuition, infinite knowledge, infinite bliss and infinite power. However, a worldly soul is always infected with matter known as karmas which obstructs these four properties. [2]. Five different types of knowledge are described which include telepathy and clairvoyance also. The material karmas are of eight major types and 158 minor types. The model is similar to quantum field theory used to study superfluid and superconductivity where one has a highly ordered ground state at low temperature and elementary excitations at higher temperature. They also define fourteen stages of spiritual evolution through which one can pass with decreasing amount of these karmas and can acquire a pure soul [3]. Three examples are given which show that during higher stages of consciousness, one can have remarkable memory and they have even tried to estimate sizes of smallest particles of matter which is comparable to the current sizes of atoms and nuclei, indicating new frontiers of knowledge [4].

1. INTRODUCTION

In Jainism, the world is assumed to be consisting of six elements. They are: Dharmastikaya (Medium of motion), Adharmastikaya (Medium of rest), Akashastikaya (Space), Pudgalastikaya (Matter), Jeevastikaya (Living beings having a soul) and Kala (Time). Jainism has defined the soul as the basic constituents of all living beings. According to the conception of Jainism, a perfect soul has infinite knowledge, infinite intuition, infinite bliss and infinite power. Although perfect soul has other characteristics but the knowledge has been regarded as the chief characteristic of soul. All

species may be physically different but are existing in the world from the past which does not have any beginning. It is due to their attachment with material particles known as karma that they continuously take birth in the world again and again. Also it is these karmas who obstruct these intrinsic qualities of the pure soul. Hence it is stated that the direction of evolution should be towards a goal of liberalizing the soul from all material attachment that is all karmas. A process of selection by oneself is involved in spiritual evolution as certain rules and principles have to be followed described separately for ordinary humans and for enlightened souls like acharyas and sadhu sadhvies etc. It appears that practices like chanting of mantras, doing meditation (samayik), fasts (upwas, aaymbil, varshi tap, mas khaman, updhan, siddhi tap, nanayanu yatras), and other several practices lead to very stable life, increase in self- confidence, recognition of inner strength of soul, and ultimately evolution of one's soul. This model is quite similar to the quantum field theory like models used to study say superfluity and superconductivity [4]. In case of QFT, we have a highly ordered vacuum state with elementary excitations on this, whose number increases as temperature increases. In Jainism, there is a pure soul with infinite knowledge and other three infinities with karmas who obstruct these qualities of the pure soul.

It is found that during the higher stages of consciousness, a person shows remarkable memory like that of Swamy Vivekanand [5]. There is a phenomenon called Shatavadhan [4] which has been found in one Jain monk these days and so he can remember one hundred questions (Appendix 2) asked by say 100 different persons in a continuous sequence and can answer them all together in same sequence or reverse sequence and random sequence in the end. Similarly a table for measurement of length is mentioned in Appendix 3, which starts from the smallest particles of matter (for all practical purposes). One finds that the size estimated by them is quite comparable to the size estimated in the modern science [4]. These examples all show existence of higher stages of consciousness which are accompanied by large increase in memory of the brain and also different mechanisms might exist to acquire knowledge. These states have less elementary excitations like entities (known as karmas in the brain).

2. THEORY OF KARMAS AND CONSCIOUSNESS IN JAINISM: AN ANALOGY WITH QUANTUM FIELD THEORY OF ELEMENTARY EXCITATIONS IN SOLID STATE PHYSICS:

According to the Jain doctrine of Karmas, every mundane soul can have an infinite knowledge, infinite intuition, infinite bliss and infinite power (Four infinities). But from an infinite time in the past, it has been infected by matter. This matter has been held responsible for the disorder present in the mundane souls. This form of matter has been termed as Karma. (The word Karma in Jainism does not mean work). The whole universe is full of that kind of matter which can become Karma. Due to the presence of different types or karmas in different quantities, different characteristics are manifested by mundane souls i.e. by different living beings. Thus a perfectly ordered consciousness is analogous to a ground state which is free from any excitations. These excitations then correspond to Karmas.

At every moment, an empirical self is attracting this matter towards him by his actions through mind and body. This matter which has now become karma then remains latent in the empirical self for some time which is determined by the passions at the time of arrival of new matter. Passions in turn are determined by karmas which are already present. Karmas have the following four characteristics (A) Nature, (B) Number, (C) Lifetime and (D) Intensity

2.1. Nature

Different properties of different systems originate from different elementary excitations. Thus phonons, rotons and vortices are meant for different properties of superfluid helium at different temperatures. Similarly in case of superconductors, there is a superconducting state with very high order and there are elementary excitations over it in form of Cooper Pairs. Similarly karmas have the following species. (number in front of each specie indicates its subspecies). Knowledge obscuring, Intuition obscuring, Feeling producing, Age determining, Belief and conduct producing, Body determining, Status determining and Power hindering.

Each one of these is held responsible for different types of disorder present in the empirical self and impedes the manifestation of true nature of consciousness. Jainas claim that all properties of living beings can be explained in terms of these 8 karmas and their 158 categories. It may be easily noted that some kind of energy gap like thing (in which space?) exists which may prevent us to realize actual

nature of consciousness.

2.2. Number

The relative number of various elementary excitations present in a systems are different at different temperatures and this number vary with temperature. In a similar way the number of karmas changes from one animate to another and within in a given animate they vary from time to time, depending on one's mental state and state of evolution. Their relative quantities are given by the following rule: The age determining species receive the smallest part; a greater portion goes to the body determining and status determining ones, both of which obtain an equal portion. More than that goes to the knowledge obscuring, intuition obscuring and power hindering species each of which gets an equal portion. Still a larger part than this goes to the belief and conduct obscuring species and the greatest of all goes to the feeling producing species. It is obvious that these karmas are not very similar to the matter which constitute the bodies of living beings but are very small in sizes.

This difference in the number will then determine different properties of different animates. In case of concept of elementary excitations, it is again the number of these excitations which determine the disorder in the state of these systems, say at different temperatures.

2.3. Life Time

The interaction among various excitations causes scattering among them. Thus in a particular state an excitation stays only for some definite time. Similarly the lifetime of the incoming karmas depends upon their interaction with karmas already present which actually determine one's passions. This lifetime is then determined by karma-karma interaction.

2.4. Intensify

Pure matter is neutral. The various effects are manifested because of its association with the soul. The effect which these karmas can show depends upon their rasa (juice) which is determined by the passions of the empirical self. This intensity is analogous to the energies of different excitations which show different properties. Thus phonons and rotons determine propagation of sound in liquid helium. The properties of sound will depend on the contribution from different parts of the spectrums of these excitations.

The concept of elementary excitations can also explain the phenomena of phase transitions. Thus different phases of helium have been tried to explain in terms of elementary excitation picture. Similar situation occurs here in this theory also. There are fourteen stages known as Gunasthānas which have been recognized in this theory which one passes before acquiring the perfect consciousness starting from a state of highest sinfulness. These have been nicely explained in terms of various karmas and their mutual interaction.

3. CURRENT MODELS OF CONSCIOUSNESS AND CONCEPT OF SOUL IN JAINISM:

In view of these problems, one finds that theory of knowledge through consciousness as described in various schools of thought in Indian philosophy seem to be very promising. In particular the Jains have defined knowledge as an essence of soul. According to their conception of Jains, a perfect soul has infinite knowledge, infinite intuition, infinite bliss and infinite power. (Mehta 1970) Although perfect soul has other characteristics but the knowledge has been regarded as the chief characteristic of soul. *Kundakunda* has stated that although from the empirical point of view there is a difference between soul and knowledge yet from the transcendental point of view it is sufficient to say that soul is knower and nothing else. He further said that there is no difference between the knower and his knowledge. From empirical point of view an omniscient (*Kevali* i.e. perfect soul) perceives and knows the whole of reality and from the transcendental point of view he perceives and knows nothing. This infinity includes five types of knowledge viz. *Shruta Jnana*, *Mati Jnana*, *Avadhi Jnana* (clairvoyance), *Manhaparyaya jnana* (telepathy) and *Keval Jnana*. The third and four are extra sensory perceptions. When a person becomes a kevali, all four types of knowledge disappear and he acquires absolute knowledge that is keval jnana, through which he perceives all characteristics of all systems in the Universe, in past, present and future, nothing is unknown to him. However, every mundane soul can attain an infinite knowledge, infinite intuition, infinite bliss and infinite power (Four infinities). But from an infinite time in the past, it has been infected by matter. This matter has been held responsible for the disorder present in the mundane souls. This form of matter has been termed as Karma. (The word Karma in Jainism does not mean work). The whole universe is full of that kind of matter which can become Karma. Due to the presence of different types or karmas in different quantities, different characteristics are

manifested by mundane souls i.e. by different living beings. Thus a perfectly ordered consciousness is analogous to a ground state which is free from any excitations and an excitation then corresponds to a Karma. Karmas are of eight different types and they obstruct the true nature of the pure soul.

At every moment, an empirical self is attracting this matter towards him by his actions through mind and body. This matter which has now become karma then remains latent in the empirical self for some time which is determined by the passions at the time of arrival of new matter. Passions in turn are determined by karmas which are already present.

Karmas have the following four characteristics (A) Nature, (B) Number, (C) Lifetime and (D) Intensity. They explain all properties of all living beings in the world. Many other details are given in other paper in this document by the author and that of Dr. Narayan Lal Kachhara

4. PHASE TRANSITIONS, *GUNASTHĀNAS* AND JAIN CONCEPT OF EVOLUTION OF SOUL THROUGH FOURTEEN STAGES IN JAINISM:

The path of evolution of soul in Jainism is described through fourteen stages through which one has to pass before getting liberalized (that is becoming a pure soul from an impure soul which is associated with many *karmas*). These fourteen stages or phases are called fourteen *Gunasthanas* (Pokharna 2012) and they are;

- *Mithyatatva,*
- *Sasvadan,*
- *Samyagya,*
- *Mithyatatva Dristhi (Mishra),*
- *Avirat Samyagya dristhi,*
- *Virtavirat (Deshvirati),*
- *Pramat Sayant,*
- *Apramat Sayant,*

- *Nivrati-Badar,*
- *Sukshma Sampraya,*
- *Upshant mohniya,*
- *Kshina mohniya,*
- *Sayogi kevali,*
- *Ayogi kevali.*

Guna means characteristics and *sthan* means a position or situation. It is very interesting to know that the Jain *Acharyas* have gone into great depth to describe these fourteen stages. They are being described through twenty nine parameters. (Pokharna 2012). The logic used in taking up so many parameters is highly impressive and there are several subcategories among these twenty nine categories also. An excellent description is given about the movement of a worldly soul from one birth to another and so on. With each stage of development, the knowledge content of soul goes up.

All species may be physically different but are existing in the world from past which does not have any beginning. It is due to their attachment with material particles known as karma that they continuously take birth in the world again and again. The direction of evolution should be towards a goal of liberalizing the soul from all material attachment that is all karmas. A process of selection by oneself is involved in spiritual evolution as certain rules and principles have to be followed described separately for ordinary humans and for enlightened souls like *acharyas* and *sadhu sadhvies* etc. It appears that practices like chanting of *navkar mantras*, *loggus*, doing *samayik*, *pratikraman*, *ekasna*, *upwas*, *aaymbil*, *varshi tap*, *mas khaman*, *updhan*, *siddhi tap*, *nanayanu yatras*, and other several practices lead to very stable life, increased self confidence, recognition of inner strength of soul, and ultimately evolution of one's soul. This is a selection type of process such that it depends more on oneself and is not much affected by other species or human beings present in the environment. It is preached that one should reduce one's requirements in such a way that even if there is scarcity of resources, lower consumption will guarantee survival of all in a cooperative way. A state of highest orderliness is defined as a pure soul, towards which, everyone has to evolve. Hence this type of spiritual evolution is different from the Darwin's principle of evolution.

5. STRICT FOLLOW UP OF FIVE MAHAVRATAS BY JAIN SADHUS AND SADHVIES SEEMS TO BE DUE TO QUANTUM MECHANICAL NATURE OF PROCESSES OCCURRING IN THE BRAIN:

In Jainism, five mahavratas are to be strictly followed by all Jain aacharyas, *sadhus* and *sadhvi* to go up in this ladder of fourteen *gunasthanas*. These five *mahavratas* are (1) *Brachamacharya* (Celibacy), (2) *Aparigraha* (minimizing one's requirements), (3) *Satya* (Truth speaking), (4) *Achorya* (Not to steal) and (5) *Ahimsa* (Non-violence). It is well known that Jain *Aacharyas*, *Sadhus* and *Sadhvis* strictly follow these principles. As human brain in general and consciousness in particular behave like a quantum mechanical system which involves very high sensitivity. Thus for example an eye is sensitive to just 3-7 photons, hence many Jain *aacharyas* do not even look at women or even their sites. There is also a need to investigate how *Brahamacharya* improves working of the brain. Does it improve memory of the person which may involve (i) to capture an event, (ii) to retain it fully in the memory and (iii) to recall it whenever desired. Many Jain monks have highly developed memory such that they can retain hundreds of events and call them at any time. *Shatavdhanies* have such great memories. It is well known that these people very strictly follow the five *mahavratas*. These Quantum mechanical models can also explain why is it so difficult to go to *Moksha*, as the discipline required is enormous due to involvement of sensitivity at various levels and in various domains and a large number of parameters.

6. HIGHER STAGES OF THE CONSCIOUSNESS REFLECTED BY A LARGE INCREASE IN MEMORY AND AWARENESS:

Remarkable memory of Swami Vivekanand implies a highly ordered state of consciousness :

It is too well known that Swami Vivekanand had such a sharp memory that he almost remembered 11 volumes of Encyclopedia Britannica, which he had just scanned once (using read would not be correct). He could virtually recall any line on any page of any of the 11 volumes available at that time. It appears that with continuous dedication and spiritual practices, the state of consciousness evolves and in many cases, it is accompanied by an increase in memory, that is improvements in capture, storage and recalling of objects and events.

6.1. Shatavadhan (Capability to memorize one hundred questions or events and recall)

An example of the hypothesis of the above formalism is given below which is called shatavadhan. Shatavadhan (Shat- 100 + Avdhan) is a power to cover 100 different activities in a single act of attention. One who reaches the stage of shatavadhan is called Shatavadhani. A shatavadhani can remember 100 different things in a 100 different orders, spoken by 100 different people. This unbelievable power has been attained by a handful of people over the human history and because it needs very high stage of spiritual development. According to the modern scientific belief, a normal human being utilizes hardly 2% to 3% of his total mental potential. A common man can hear and remember serially 3 or 4 at a time. This is based on conscious mind. Anyone with exceptional intellect can extend this number from 3-4 to 10-11. However, taking this number to 100 is beyond the powers of most of the people. Shatavadhan is the ability to receive, retain and retain 100 activities accrued through eyes or ear during one period of attention and carried from the conscious to the subconscious. In Jain tradition one can name Shrimad Rajchandra, Guru of Mahatma Gandhi [6,7].

Similarly these days, Ajeet Chand Sagarji Maharasahab (sitting left in the photograph below), a shatavdhani has demonstrated his spiritual powers in Ahmedabad (2008) and Mumbai (2012) who can listen to two hundred questions (or scenes he watches) asked by say two hundred persons at a stretch for say four hours and can answer them in the same sequence or reverse sequence after four hours, just like a machine with almost 100 percent accuracy. He is expected to give a similar demonstration involving 500 avadhans in Mumbai on November 16, 2014.



Figure 1. Mahashatavadhani Pyjyaniya Ajeet Chand Sagarji Maharasahab (left) sitting with his Guru Pujyaniya Acharya Shri Naya Chand Sagarji Maharasahab. He gave a demonstration of 500 avadhans in Mumbai on November 16, 2014.

6.2. Did ancient Jain Acharyas tried to estimate size of smallest particles of matter: An evidence that some unexplored mechanism to acquire knowledge exist:

Another example is taken from ancient Jain scriptures [8]. It gives a Table for measurement of length (Appendix 3). It starts from the smallest particle of matter and goes up to one Yojana (a commonly used unit of length prevalent in ancient India). It indicates that ancient Jain acharyas have made an attempt to develop a table for measurement of length in 20 steps. This is an octal system till step 12. As explained in the Appendix 3, if we statistically interpret it then we find that as per their assessment, the size of the smallest particle of matter (known as avsannasanna skandha from practical point of view in prakrit language) is 2.9×10^{-11} cm. This value lies in between the size of a modern atom (10^{-8} cm) and size of a nucleus (10^{-13} cm). Now we may not be knowing the meanings of many of

the objects used in this Table. But statistically, this is a very significant observation and should be taken quite seriously by the scientists. At least it should not be ignored. The mere fact that it was arrived at from the telepathy of advance level through which one can see even the smallest particle of matter should be a very exciting observation. This again shows that the Jain concept of knowledge should be taken very seriously by the scientific community and should be further explored in a careful way.

Now the mere fact that this concept might have evolved through a realization of this higher level of consciousness is worth examining. It appears to involve advanced telepathy (known as avadhi jnana in Jainism) or some type of advanced knowledge.

7. IS KNOWLEDGE REALLY STRUCTURED IN THE CONSCIOUSNESS: QUBITS, QUANTUM INFORMATION AND THE BRAIN:

Actually the recent developments in computer science and neurobiology clearly show that knowledge is nothing but information organized in some way [9] and information in turn is just organization of data in some fashion. It is also realized that human consciousness (and even animal consciousness) is capable of organizing these data and can generate information and hence knowledge in some way [9]. Therefore what we call as scientific knowledge is just a subset of this grand concept of knowledge, which can exist in the human consciousness. Because all interpretations of all scientific experiments are ultimately done by human consciousness [10]

Actually it is argued that quantum computers like processes are possible in the human brain even at biological temperature [11]. It is claimed that human sub-consciousness mind works on the basis of quantum computers (assuming tubulin's groups acting as a cellular automata), and so its activities are hidden from us. When the Orch OR takes place, one enters into classical world. Now let us look at the following numbers: [11,10]

- Number of neurons in the human brain: 10^{11}
- Number of synapses per neuron in the human brain: 10^3
- Number of operation per synapses in one second: 10^3
- Number of bit states per second in the human brain: 10^{17}
- Number of tubulins per neuron : 10^7
- Number of oscillation per Microtubule : 10^8

- Nanosecond switching in Microtubule automata per neuron per second : 10^{16}
- Hence for a human brain, number of bits offered per second: 10^{27}

Thus till quite recently, capacity of human brain was assumed to be possess 10^{17} bits states per second in the human brain. It was based on the assumption that there are 10^{11} neurons in the brain, and on the average there are 10^3 synapses per neuron and again there are around 10^3 digital operations per synapse per second. And these are treated as classical bits. However, with the new discovery of tubulins who individually and collectively (entanglement) behave as quantum systems, this human capacity has gone upto 10^{27} quantum bits of information. It is so because now there are around 10^7 tubulins and there can be at least 10^9 (actually in the range of 10^9 - 10^{11} oscillations per second). So this number of 10^{16} has to be multiplied with the total number of neurons in the brain is, which is 10^{11} . This may be compared with performance of the best supercomputer in the world that is A 1 exa FLOPS (EFLOPS) computer system, which is capable of performing one quintillion (10^{18}) floating-point operations per second. However, in case of brain, these bit states are not classical bits but quantum bits (known as qubits). Hence this will ultimately leads to almost infinite information, as per the latest work in the field of quantum computers and quantum information. This means that a human brain essentially can possess almost infinite knowledge. This idea is therefore very close to the concept of infinite knowledge possessed by a pure soul in Indian philosophy in general and Jainism in particular.

It appears that the spiritual practices of Jain and other Indian monks results into decrease in decoherent activities in their brain and realization of the quantum information through the biological quantum computers.

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Appendix 1.

Jainism , traditionally known as Jaina Dharma is an Indian religion that prescribes a path of non-violence towards all living beings and emphasizes spiritual independence and equality between all forms of life. The essence of Jainism is concern for the welfare of every living being in the universe. Practitioners believe that non-violence and self-control are the means by which they can obtain liberation. Jains believe in the notion that truth and reality are perceived differently from diverse points of view. This doctrine is formally called *anekantavada*. According to it, human beings are always limited in their perception and knowledge about the reality. They can thus have only partial information/knowledge of reality. Philosophical and theological disputes arise only because of the partial knowledge of human beings. The Jain doctrine stresses on the existence of soul. According to Jainism, every living being is a soul and have a separate existence from the body that houses it. This soul undergoes a cycle of reincarnations. Jainism postulates the existence of fine particles of matter called *karma*. These karmic particle are attached to the soul from infinite past. On account of the soul's interaction with the karmas and it is through this karma that the soul is reincarnated and feels pleasure and pain.

The word Jainism is derived from a Sanskrit verb *Ji* which means *to conquer*. It refers to a battle with the passions and bodily pleasures that the *Jaina* ascetics undertake. Those who win this battle are termed as *Jina* (conqueror). The term *Jaina* is thus used to refer to laymen and ascetics of this tradition alike. Jainism is one of the oldest religions in the world. Jains traditionally trace their history through a succession of twenty-four propagators of their faith known as *tirthankara* with Ādinātha as the first *tirthankara* and Mahāvīra as the last.

Appendix 2. Details of one hundred questions answered in same sequence by Shri Ajeet Chandra Sagarji Maharasahab in the process of Shatavdhan.

1 to 10	One Line sentences may be in questioners form
11-20	Words of Wisdom in a sentence of 5 to 7 words
21	First line of a Sanskrit Shloka
22 to 30	Synonym or Antonym in Gujarati
31	Second line of the same Sanskrit Shloka
32 to 40	Idioms
41	Third line of Sanskrit Shloka
42 to 50	Any first line of the same Sanskrit Shloka
52 to 60	Names of any priest, religious book or religious place
61	A mathematical puzzle
62 to 70	Name of any philosopher, scientist or patriotic person
71	First part of 16 Blocks- mathematical miracle
72 to 80	See and Remember (Darshan Avadhan)
81	Second part 16 blocks- mathematical miracle
82 to 90	See and Remember (Darshan Avadhan)
91	9 Blocks- Mathematical miracle
92 to 99	Mathematical calculation with 8 persons
100	Day of the Birthday
101-104	A line from Religious, cultural or patriotic song
105 to 108	Shloka from Jain Aagams

Appendix 3. Table of Measurement of Length as Found in the Jain Literature [8]

(1)	Infinitely many parmāṇus	= 1 Avasannasanna skhandha
(2)	8 Avasannasanna units	=1 Sannasann askandha
(3)	8 Sannasanna units	=1 Trutṛeṇu
(4)	8 Trutṛeṇu units	=1 Trasareṇu
(5)	8 Trasareṇu units	=1 Rathareṇu
(6)	8 Rathareṇu units	=1 Uttama bhogbhūmi bālāgra
(7)	8 U. b. b. units	=1 Madhyama bhogbhūmi bālāgra
(8)	8 M. b. b. units	=1 Jaghanyabhogbhūmibālāgra
(9)	8 J. b.b. units	=1 Karma bhūmi bālāgara
(10)	8 K. b. b. units	=1 Likṣā
(11)	8 Likṣā units	=1 Yūkā
(12)	8 Yūkā	=1 Yava (Barley corn)
(13)	8 Yava units	=1 Angula (Finger breadth)
(14)	6 Angula units	= 1 Pāda
(15)	2 Pāda units	=1 Vitasti
(16)	2 Vitasti units	=1 Hasta (Forearm)
(17)	2 Hasta units	=1 Rikku or Kisku
(18)	2 Kisku units	=1 Daṇḍa or Dhanus (Bow)
(19)	2000 Daṇḍas units	=1 Krosa
(20)	4 Krosa units	=1 Yojana

Here a parmāṇu has been defined as the smallest particle of matter having no length, no breadth and no height. This is defined as a particle which can be only thought of but is not practically perceivable. The particle which is perceivable is a group of parmāṇus. The smallest of such skandha is an avasannasanna skandha. Let us therefore estimate its size by roughly taking the average size of a finger to be equal to 2 cm. We can therefore write the following simple formula by using the above table .

$$2 \text{ cm} = 8^{12} \times \text{size of avasannasanna skandha}$$

$$\text{Therefore Size of avasannasanna skandha} = 2 \times 8^{-12} \text{ cm.}$$

$$= 2.9 \times 10^{-11} \text{ cm.}$$

Hence the size of smallest particle of matter that is avasannasanna skandha is around 2.9×10^{-11} cm. This value lies in between the size of a modern atom (10^{-8} cm) and size of a nuclei (10^{-13} cm). Now we may not be knowing the meanings of many of the objects used in this Table. But statistically, this is a very significant observation and should be taken quite seriously by the scientists. At least it cannot

be ignored. The mere fact that it was arrived at from the telepathy or some advanced channel of knowledge through which one can see even the smallest particle of matter. This again shows that Jain concept of knowledge should be taken very seriously by the scientific community and should be further explored in a careful way.

<8>. Quantum Mechanics and Human Decision Making

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In physics, at the beginning of the twentieth century it was recognized that some experiments could not be explained by the conventional classical mechanics, but the same could be explained by the newly discovered quantum theory. It resulted in a new mechanics called quantum mechanics that revolutionized scientific and technological developments. Again, at the beginning of the twenty-first century, it is being recognized that some experiments related to the human decision-making processes could not be explained by the conventional classical decision theory but the same could be explained by the models based on quantum mechanics. It is now recognized that we need quantum mechanics in psychology as well as in economics and finance. In this paper we attempt to advance and explain the present understanding of applicability of quantum mechanics to the human decision-making processes. Using the postulates analogous to the postulates of quantum mechanics, we show the derivation of the quantum interference equation to illustrate the quantum approach. The explanation of disjunction effect experiments of Tversky and Shafir (Tversky A, Shafir E (1992) The disjunction effect in choice under uncertainty. *Psych. Sci.* 3(5):305–309) has been chosen to demonstrate the necessity of a quantum model. Further, to suggest the possibility of application of the quantum theory to the business-related decisions, some terms such as price operator, state of mind of the acquiring firm, etc., are introduced and discussed in context of the merger/acquisition of business firms. The possibility of the development in areas such as quantum finance, quantum management, application of quantum mechanics to the human dynamics related to healthcare management, etc., is also indicated.

Introduction

It is well known that quantum mechanics leads to many peculiar results such as quantum interference, uncertainty principle, quantum nature of light, quantum theory of measurement, tunneling, etc., which are in contradiction with our common sense and classical mechanics. Physicist Niels Bohr, who won the 1922 Nobel Prize in Physics chiefly for his work on atomic structure, once remarked, “If quantum mechanics hasn’t profoundly shocked you, you haven’t

understood it yet” (Bohr n.d.).

Despite its strange behavior, the quantum mechanics is considered as the most successful theory of physics. Stenholm and Suominen (2005, p. 1), in their book on quantum approach to informatics, write: “Quantum theory has turned out to be the most universally successful theory of physics. Without the understanding offered by quantum theory, our ability to build integrated circuits and communication devices would not have emerged.” A large number of scientists (e.g., Planck, Einstein, Bohr, de Broglie, Heisenberg, Schrodinger, Born, Dirac, Pauli, Pauling) have been awarded Nobel Prizes for their contributions related to quantum mechanics. In various walks of modern science and technology, including electronics, nuclear technology, nanotechnology, femto-chemistry, molecular biology, cosmology, high-energy physics, quantum mechanics is valuable and indispensable.

In recent years, one notes a growing interest in the application of quantum mechanics to areas such as quantum cryptography (e.g., Bennett and Brassard 1984, Bennett et al. 1992, Chung et al. 2008) as well as quantum computation (e.g., Shor 1997, Lo et al. 2000, Hand 2009). As regards the application of quantum mechanics beyond physical sciences, Bohr (1929) attempted to show the similarity between the mental processes and the quantum mechanical phenomena. In his writings, he also discussed the similarities between quantum mechanics and the functions of the brain (e.g., Bohr 1933). In recent decades, there have been various notable attempts to ascribe the quantum mechanical properties to brain, mind, and consciousness (e.g., Chalmers 1996, Lockwood 1989, Penrose 1989, Penrose et al. 2000, Pessa and Vitiello 2003, Satinover 2001).

Recently there has been some new work to explore applicability of quantum models in better understanding nuances of human decision making. The purpose of this paper is to introduce and explain the quantum concepts through simple terms and notations, to apply these concepts in better understanding the recent applications of quantum mechanics to

1.1 Quantum Mechanics and Human Decision Making

human decision making, and to suggest applicability of models based on quantum mechanics to some new areas of research. 1.1. Quantum Mechanics and Human Decision Making Regarding the human mind, economics Nobel Laureate Herbert Simon wrote in collaboration with Newell (Simon and Newell

1958, p. 9): “The revolution in heuristic problem solving will force man to consider his role in a world in which his intellectual power and speed are outstripped by the intelligence of machines. Fortunately, the new revolution will at the same time give him a deeper understanding of the structure and working of his own mind.” It is interesting to note the significance attached by these authors to quantum mechanics in the same paper in these words: “In dealing with the ill-structured problems of management we have not had the mathematical tools we have needed—we have not had ‘judgment mechanics’ to match quantum mechanics” (p. 6). The expectations of Simon and Newell, expressed half a century ago, regarding the necessity of understanding of our own mind and a mechanics of the decision-making process are not yet fulfilled. However, we are now gaining momentum in the direction of understanding the human decision processes even through quantum mechanics. Thus, the objective of this paper is to introduce these concepts and review the recent progress to stimulate more exploratory research on applications of quantum mechanics concepts in decision making.

Kahneman, Tversky, and Shafir have made notable contributions in the area of judgment under uncertainty and the influence of heuristics and biases on the cognitive system (Tversky and Kahneman 1974, Tversky and Shafir 1992, Shafir and Tversky 1992). The significance of the work is attested to by the fact that Kahneman was awarded the Nobel Prize in 2002. Results of several experiments related to the judgment under uncertainty, as noted by Tversky and Shafir (Tversky and Shafir 1992, Shafir and Tversky 1992), in the area of human psychology could not be explained by the classical statistics. The disjunction effect experimentally observed by Tversky and Shafir (1992) is a typical example of the intricacies of the human mind that could not be understood by the classical decision theory. For example, in an experiment of Tversky and Shafir (1992), a participant is offered to play a gamble (by tossing a coin) with a 50% chance of winning \$200 and a 50% chance of losing \$100. After the first play, the participant is offered to play the second identical game with or without the knowledge of the outcome of the first gamble. It has been observed that a majority of participants are ready to accept the second gamble after knowing that they have won the first one, and a majority of participants are also ready to accept the second gamble after knowing that they have lost the first one, but only a small fraction of participants are ready to accept the second gamble if they do not know the outcome of the first gamble. The question arises: if they prefer to accept the second gamble in case they win or lose the first gamble, then according to the sure-thing principle of Savage (1954), they should prefer to accept the second gamble even when they do not know the

outcome of the first gamble. However, the experiment contradicts such logical expectations. Why? We could not yet get the answer of this “why” from the conventional (classical) theories. Such a violation of the sure-thing principle of Savage (1954) has also been observed by Tversky and Shafir (1992) in another experiment related to buying an attractive vacation package.

The successful studies to explain some of these paradoxes by incorporating mathematical equations related with quantum mechanics into the psychology (Aerts 2009, Busemeyer et al. 2006, Pothos and Busemeyer 2009, Khrennikov 2009, Yukalov and Sornette 2009a) clearly reveal that some aspects of the human behavior, which could not yet be explained by the classical decision theory, can be explained by quantum mechanical equations. The investigations of Bordley (1998) and Bordley and Kadane (1999) also suggest the importance of quantum mechanical notions and equations in explaining some aspects of human decision making. It may be noted that classical mechanics and quantum mechanics differ ideologically as well as mathematically; and for macrosystems the approximate form of mathematical equations of quantum mechanics agrees with the equations of classical mechanics.

If the decision-making processes of the human mind follow the probabilistic behavior of quantum mechanics, then one can expect the applicability of the same in other areas, which are directly affected by human decision making. Thus, it is not surprising that researchers in economics and finance have explored application of quantum mechanics (Baaquie 2004, Bordley 2005, Kondratenko 2005, Baaquie 2009a). The application of quantum mechanics to economics and finance can be seen in various areas, such as a price dynamics model (Choustova 2007), stock price (Schaden 2003, Bagarello 2009), interest rate (Baaquie 2009b), incorporation of private information (Ishio and Haven 2009, Haven 2008), etc. As an example of the value of quantum mechanics in the field of economics, one can refer to the study conducted by Segal and Segal (1998). In this study they consider quantum effects to explain extreme irregularities in the evolution of prices in financial markets. In the concluding paragraph of this study, Segal and Segal (1998, p. 4075) write: “The quantum extension of Black-Scholes-Merton theory provides a rational, scientifically economical, and testable model toward the explanation of market phenomena that show greater extreme deviations than would be expected in classical theory 0 0 0 0”

In Appendix-A in the e-companion, we have described some facts related to the historical development of quantum mechanics. At the beginning of the twentieth

century, it was recognized that some experimental results could not be explained by the conventional classical mechanics, but the same could be explained by the newly discovered quantum physics. It resulted in a new mechanics called quantum mechanics that revolutionized scientific and technological development. The uncertainty principle, the quantum theory of measurement, the statistical significance of the wave functions of quantum mechanics, the mathematics involving operators and the abstract vector space, quantum statistics, etc., are some of the various features of quantum mechanics that are not available in the conventional classical mechanics. Therefore, in case of difficulty in explaining some aspects of psychology, or economics, or any other branch of knowledge through the classical mechanics, one may expect that some special features of quantum mechanics may be helpful. As mentioned earlier, we have already noted some success in this direction in the area of human decision making. In view of such aspects, it becomes valuable to be familiar with some basics of quantum mechanics.

By the phrase, “understanding human decision process through quantum mechanics,” we mean the application of some aspects, such as mathematical framework, of quantum mechanics. For example, we may consider some states of mind in an abstract space that mathematically behave as the quantum states in the Hilbert space (von Neumann 1983, Messiah 1970), and the decision-making process as a process statistically governed by the formulation based on the postulates of quantum mechanics. This, however, does not mean that the human mind becomes a quantum mechanical object. Just as a quantum description of electrons, light quanta, etc., require the necessity of a constant known as Planck’s constant ($h = 60626 \times 10^{-34}$ Joule-Second), we do not need Planck’s constant for explaining the above mentioned disjunction effect or other paradoxes of psychology. Likewise, in quantum mechanics, Schrodinger’s “time-independent and time-dependent wave equations contain Planck’s constant, but in the corresponding equations of quantum dynamics of human decision making (Busemeyer et al. 2006, Pothos and Busemeyer 2009), this constant occurring in the equations of quantum mechanics is replaced by another parameter.

1.2. Application of Quantum Models to Disjunction Effect and Other Decisions

While explaining the disjunction effect and other paradoxes of psychology with the help of quantum models, Khrennikov (2009) considers the effect of quantum interference in the form of an equation that has an adjustable

parameter called the coefficient of interference. Yukalov and Sornette (2008, 2009a, b, c) provide a detailed theory called quantum decision theory (QDT). Using the postulates analogous to the postulates of quantum mechanics, they derive the quantum interference equations that relate various experimental probabilities.

To explain the same disjunction effect, Pothos and Busemeyer (2009) consider the evolution of the state of mind using an equation analogous to Schrodinger's " time-dependent wave equation of quantum mechanics. The duration of time and the interaction parameters have been considered as adjustable parameters. For comparison, they also study the evolution of the state of mind using the equivalent Markov (classical) model, and found that their Markov (classical) model could not explain the experimentally observed violations of the sure-thing principle of Savage (1954), whereas the quantum model could explain them. In a quantum decision model discussed in detail in §2, we employ various aspects of the quantum decision theory of Yukalov and Sornette (2009a) but consider more general and simpler kinds of operators to derive the same quantum interference equation as derived by Yukalov and Sornette (2009a), so that the range of applicability may widen and it becomes easier to apply to other related problems. Further, to demonstrate the possibility of application of the quantum approach to other decision problems, we consider an example of the problem of a merger of two business firms. It may be a long way to arrive at a successful and valuable outcome of the application of a quantum model to the problem of merger of two business firms. However, here we shall simply introduce the problem to familiarize the reader with the notations and application of the quantum models in this area.

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<9>. Soul (*Jiva*) and Consciousness in Jainism

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1 Soul (*Jiva*) in Jainism

In Jain metaphysics the universe comprises of six kinds of substances, two of them *Jiva* (soul) and *pudgala* (matter) are active substances and the other four i.e. *dharmastikaya* (the passive agent that helps motion of *jiva* and *pudgala*), *adharma* (the passive agent that helps the rest position of *jiva* and *pudgala*), *akasa* (space) and *kala* (time) are inactive substances. *Jiva* is sentient and *pudgala* is non-sentient substance, the two can combine according to some defined rules. The smallest indivisible constituent of *pudgala* is *paramanu* and all matter and energy (or any other form of physical order of existence) in the universe are aggregates of *paramanu*. The *jiva* is found in two states pure and impure, all embodied souls are impure.

The term *Jiva* connotes that Soul is conscious of itself and consciousness also is invariably soul. The *Jiva* is non-corporeal, living, eternal and permanent, and fixed (constant) substance of the Cosmic Universe, having the attributes of consciousness (*Chetana*). *Jiva* is the generic name of sentient substance. *Jiva* substance is non-physical and is not sense - perceptible; it does not have the properties of color, smell, taste and touch. Consciousness and *upayoga* (manifestation of consciousness) are the differentia of the *jiva*. *Upayoga* and consciousness are the two sides of the same entity *jiva*. Consciousness may be interpreted both as a structure and a function of the *jiva* but *upayoga* refers to the functional side only. *Upayoga* gives us almost the same meaning as we get by being mentally active. Just as a mental activity is a fact of mental functioning and a mental capacity, a fact of mental structure; in the same way consciousness or *chetana* may be taken as a fact of the *jiva's* structure and *upayoga*, as a fact of the *jiva's* function.

Consciousness is the generality of the attributes (if not of all the attributes of the *jiva*), which distinguish the *jiva* from the inanimate. *Upayoga* is the generality of the manifestations of such attributes. Both of them are comprehensions of the

object by the subject. Intelligence (*jnana*) and self-awareness or awareness (*darshana*) are agreed to be the two main manifestations (*upayoga*) of consciousness. This shows that the attributes of intelligence and self-awareness alone cannot be given the status of consciousness, as is generally understood, in the structure of the *jiva*; and these alone will not constitute the differentia of the *jiva*.

Consciousness in mundane souls manifests itself in several ways: like intelligence, knowledge, awareness, bliss, perception (cognitive elements), emotions, will, attitude and behavior, and awareness of pleasure and pain. Life and consciousness are coextensive, wherever there is life there is consciousness and vice versa. But there are degrees of explicitness or manifestation of consciousness in different organisms. In the lowest class of organisms, it is very much latent, while in human beings, it is very much manifest. *Jiva* is entirely distinct from inanimate existence, which does not possess consciousness.

Among many capacities of the (mundane) soul the main and most comprehensible of all are capacity of cognition and perception, capacity of energy, capacity of volition or desire and capacity of attitude of mind or belief. Knowledge is output of cognition on manifestation of *jnana*, intelligence, and perception, awareness of impression formed in a particular context. *Jiva* is endowed with energy, exertion, action, strength, effort and vigor, and it manifests its sentiency by the state of itself, because soul having the inherent attribute of consciousness attains cognition of infinite modes of all kinds of knowledge and those of wrong knowledge, those of self-awareness, etc.

The soul is *jnana* (intelligence), i.e. endowed with right knowledge in some respect and also wrong knowledge in other aspect; the *jnana* itself is invariably soul, for consciousness is its inherent quality. Soul is the knower and *jnana* is the means of knowing. Similarly, self-awareness and awareness of outside objects are correlated, because soul is possessed of the natural capacity of taking note of the external objects; it is the knower. It is also invariably self-awareness (*darhsana*) and self-awareness is invariably soul itself.

Life-essentials of worldly embodied souls are represented by (up to) five senses, mental, vocal and bodily activities, duration of life and respiration. Whatever things and behaviour it makes are reflected in it, one fine material body, called karma body, containing an impression of these forces and activities, the karmas, is being formed by it, and that body exists and accompanies it at the time of forming another body on rebirth.

Jīva and karmas, made up of special type of *pudgala-skandhas* (*karman vargana*), are mutually associated. Karma *pudgalas* affect *jīva* in a peculiar way. All the souls in this universe undergo effects such as sorrow, happiness, birth, death etc. so long as they are afflicted by karma-*pudgalas*. The souls who get emancipated from the effects of karma-*pudgalas* are designated as ‘*Paramatma*’ or ‘*Siddha*’.

Jiva, though being conscious and non-corporeal, becomes corporeal by the effect of collected (formed) corporeal body up to the moment of existence of such body. As to its relation with body it is defined that mundane soul is identical with body, with the former existing in the latter. Thus the soul is corporeal and non-corporeal, conscious and non-conscious, living and non-living and it is of beings and non-beings also. Dimension of extent (*parimana*) of soul decreases and increases according to the size of body. This change does not affect its fundamental substantiality; its basic nature remains unchanged. This is one kind of doctrine of transformation and also the doctrine of permanence-in-change. Its other aspect is the variation in manifestation of the quality or capacity of soul; it becomes the nature of permanence-in-change of the capacity.

Souls are existent in every iota of space beginning with one or more countless fractions of it up to the whole universe, i.e. if space is divided into countless points the size of a soul can be so small as to occupy one or more of these points of space, called *pradesas*, and in special cases, of *samudaghata*, the size of a single soul can fill the whole universe. Thus the number of *pradesas* in each individual soul is assumed to be equal to the number of *pradesas* in the Universe, which is countless. There is no such place in the universe where there is no existence of souls having fine or gross bodies.

There are infinite number of souls in both the mundane and the emancipated categories. In the multitude of souls the inherent capacity of soul is accepted as one (equal), nevertheless, the manifestation of each one is not equal. It is conditional upon the strength of its efforts (*purusartha*) and other causes. It means that the capacity of soul is one, viz. consciousness, but it manifests itself in and through these stages. Soul in the absolute sense is imperishable, immortal and impenetrable; none can cause pain or destruction to it nor can cut its inner points by touching it with hand or cutting it with a sharp weapon or burning it with fire; no weapon can enter into it.

The soul is eternal from the point of view of time and non-eternal from that of the state of existence (*gati*), as it is studied from its substantial and modal

aspects respectively, for it was in the past, is at present and will be in future, and it undergoes change or transformation from one mode (life) to another.

In nutshell the nature of *Jiva* conceived in Jain philosophy is that it is super sensuous, imperishable, immortal, impenetrable, non-corporeal, eternal and non-eternal, infinite and finite, and dynamic in nature.

In general the following facts apply to the soul:

1. In the embodied existence, soul and body appear to be same but this is not really so.
2. Body is different from soul.
3. Soul contracts or expands to occupy the space of the body. The same soul can pervade the body of an elephant or an ant. Notwithstanding the size of the body, the number of *pradesas* of soul remains the same (countless).
4. Soul in the absolute sense is non corporeal and is recognized by his power of perceiving and knowing objects.
5. Soul is the source of awareness, knowledge, perception, happiness and vitality in a living organism.
6. Being invisible, soul is identified by his ability of cognizance, an embodied soul desires for comical amusement, recreation, pleasure, speech, movement etc.
7. The karma *pudgalas* attracted by a soul get converted into karma unaided.
8. The thoughts and actions of a soul leave a permanent impression. These impressions are stored in the karma body, which moves with the soul in his journey from one body to another.
9. The bondage of soul and karma is beginning less. The karma can be shed from the soul by practicing austerity and penance. This in fact, is the way to get rid of karma and attain the state of emancipation.
10. Soul is non-corporeal but he is embodied due to his impurity in the presence of karma.

11. All living organisms have similar potential powers and abilities but every living organism is in a different state of manifestation. The development of the soul is determined by his purifying efforts and other karma related factors.

12 There is no place in *loka* where soul is not present either in subtle or gross form.

2 Soul: The Subject and the Object

In the absolute sense the soul can only be conscious of itself, because it alone exists as that state of pure singularity. When we say 'it is conscious of itself', we separate the intellectual level into two aspects: (1) the aspect that it is observer and (2) the aspect that it is observed (although they are one and the same). Intellectual examination, in fact, reveals the existence within consciousness of three values, inherent in any process of conscious experience or any process of observation: (1) the observer, (2) the observed, and (3) the process of linking the observer and the observed. Even though there is nothing but one consciousness, this principle of three emerges. Consciousness being awake to itself experiences itself, and is at once the knower, the process of knowing, and the known-observer, process of observation, and observed; or subject, object, and the process of linking them. In this state of absolute consciousness, these three values are one and the same, yet they represent these aspects of the same singularity.

It is obvious that every relative experience requires a subject coming together with an object. This coming together takes place both on the level of attention as well as on the sensory level of perception. When the subject comes together with the object through the process of observation, then the experience occurs- the subject knows the object. Knowledge therefore, is the result of the coming together of the observer, the process of observation, and the observed.

As one consciousness leads to three aspects, the interaction between the three and the resultant aspects, relationships, and their interaction, etc. leads to an infinite number of ever-expanding possibilities. All these possibilities, all these forces of interaction and relation, exist in the soul.

The interaction of forces, even though within the soul, creates a dissymmetry, as if a distortion, in the flat and homogeneous- yet infinitely flexible- absolute singularity of soul. The virtual pull and push, rise and fall, vibration and silence, dynamism and silence, leads to the formation of virtual

structure within the soul. This structure is the result of apparent breaking of infinite symmetry. With all interactions always taking place in accordance with the fundamental forces that uphold them, the structure is the result of the virtual distortion generated by the interaction of forces.

In the pure soul or the soul of the Omniscient this structure is absent and the subject and the object is the same pure consciousness. In the impure soul the subject is the consciousness and the object is the structure created by the virtual distortion. The structure identifies the perverted state of the soul.

3 Relations between Soul and Body

How is the soul related to body? This needs some explanation. But first the doubt of some that soul exists must be clarified. The following arguments support the existence of the soul.

1 Self-consciousness is possessed by a living being like I am, I am happy, I am sad, etc. The body does not make such experiences. Expressions like, I have done it, I do it, I will do it indicate the existence of another principle, soul the doer.

- The intention of doubt, curiosity, inquisitiveness, etc. is expressions of consciousness (impure). The doubt I am or I am not, also generates in the soul and not in the body.

- The soul is the counterpart of matter (*ajiva*). The existence of a substance without a counterpart cannot be supported logically.

As the soul is non-corporeal, it cannot be perceived or known by the senses, mind and intellect. Its attribute is consciousness, which too is beyond the reach of perception. It (consciousness) can be known only through its function, but it cannot be directly comprehended through sensory perception. The denial of the existence of the soul may chiefly be attributed to its imperceptibility.

We mentioned above that the soul extends the body. The soul being non-physical in fact has no contact with the body. The relation with the body is made through karma. The soul is bound with karma but it has no contact with the karma either. The soul and karma has an association of essential nature. The soul does not occur without association with karma in nature, that is, the soul is always in impure state unless purified by special efforts. Was the soul without karma at any time in the past? No, like any other chemical element the soul is also found in impure state, impregnated with karma, in nature. The karmas bond because of the

very nature of the karma *pudgala*, the subtle cosmic matter, which are attracted by the soul due to its activities. The processes taking place in the soul due to its activities and that in the karma body run parallel, the soul experiences modification of its state and there is corresponding change in the karma body. The soul and karma are always in a state of some kind of equilibrium. The soul becomes free of karma only in the liberated state when all the karma is eliminated by special efforts. Once free no more karma is bound and the soul is not embodied again. The soul has innumerable *pradesas* and the karmas bond uniformly on each *pradesa*, there is no *pradesa* of soul without karma.

The body is constituted of cells. The soul *pradesa* and karma are supposed to extend in each cell. There is life in the body so long as soul is associated with it; the body is dead when the soul departs. The soul extends in the cells of the body. Our body also contains some hollow spaces and spaces where the waste material like urine and stool etc. are stored. These spaces do not contain cells and the soul does not extend there. The cells (live) are the medium through which we experience pain and pleasure, because of presence of the soul; the empty spaces, and dead cells, do not cause any sensation. The sensation of pain and pleasure is made by the soul through karma, in the absence of karma the soul does not have such sensation, and it experiences the bliss which is its natural attribute. It may be mentioned here that if pain is negative excitation, pleasure is positive excitation and the bliss is state of no excitation of the soul.

The physical sense organs, *dravyendrian*, have their counterpart in the soul structure known as *bhavendrian* or the psychic senses. The psychic senses are in the form of manifested *jnana* and *darshana* due to annihilation-cum-subsidence of respective karma. The physical sense organs are formed by rise of biological karma and perform the function of sensing because of existence of corresponding psychic sense, that is the intelligent action performed by sense organs is due to manifestation of *jnana* and *darshana* attributes of the soul or *upayoga* of consciousness of the soul. Mere existence of organs in physical form, as in a dead body, cannot perform the intelligent action in the absence of soul.

Physical sense system has two parts *nirvriti* and *upakaran* and each of these has two sub parts. The sub parts of *nirvriti* are (a) the outer part in the form of physical sense organ, and (b) the inner part in the form of some soul structure. *Upakaran* assists *nirvriti*. The outer part of *upakaran* is physical, implying brain that assists senses to comprehend the object. The inner part of *upakaran* is again some structural aspect of soul. Physical sense organs successfully work when both *nirvriti* and *upakaran* are functional; in case of malfunctioning of any of

them the intelligent action is not performed.

The psychic senses have two aspects *labdhi* and *upayoga*. *Labdhi* refers to potential power of the soul due to removal or annihilation-cum-subsidence of knowledge obscuring karma. *Upayoga* refers to manifestation of power of the soul on removal of obstructing karma and it is of two types one vested with form, *sakara* or plural, and the second formless, *nirakara* or singular. The first refers to *jnana* and the second to *darshana*. So *bhavendrian* essentially mean manifestation of consciousness of the soul as *jnana* and *darshana* attributes, which are instrumental in performing the intelligent action by an organism.

The power of action of different senses varies. Vision is the most powerful of all senses; it can sense even an object that is not very clear. Next in power is sense of hearing, it can sense a word that is clear. The remaining three senses, taste, smell and touch, are least powerful, they sense objects that become clear by actual contact. Sensual experience takes place when contact is established with the object with at least one sense. In case of mental experience contact with the object is not necessary. In this case transformation of mental states takes place according to the target subject. The knowledge gained through senses is further augmented by mind. Pleasure and pain are experienced both by physical sensing and mental thinking. Generally experience involves both physical and mental processes. Mental phenomena may or may not involve operation of senses but any sensual activity necessarily involves mind.

4 The Worldly Soul

The worldly soul is impure as stated above. The presence of impurities in the soul can be explained in a simple manner. When you stand in front of a mirror you see your image. The image is not real, it is virtual, but looks like real. The image is gone when you move away as the mirror has no arrangement to store the image; in fact mirror is only a reflecting surface, it is light that forms the image. In the case of an organism it is assumed that the soul acts as mirror. The image of the object in front is stored in the soul and remains in its memory even when the object is removed or moves away. This is the example of use of sense of sight. The soul has been interacting with the environment with all the five senses and mind and the images so formed are stored on each interaction. Over the period of time of its life journey the soul has stored a very large amount of images, which are present as impurity. The structure created by collection of these images, known as *bhava* karma, is virtual but it has real effect on the soul. This simple explanation is for easy understanding; the actual mechanism of formation of

impurities is based on the principle of karma which is the subject of another chapter.

We need to understand the structure and functioning of the impure soul in little more detail. The beginning less soul initially is in *nitya nigoda* state having highest impurity. *Nitya nigoda jivas* exist in the bottom most part of *loka*. This is inactive state of the soul. At appropriate time the soul comes out of *nitya nigoda* and assumes the active form when its impurity changes with time due to changes in karmic load. Figure 1 represents the state of the soul at three different times t_0 , t_1 and t_2 having different amount of impurity, which is highest at $t=t_0$, the *nitya nigoda* state, and becomes progressively less at $t=t_1$ and $t=t_2$ in its journey of progressive development.

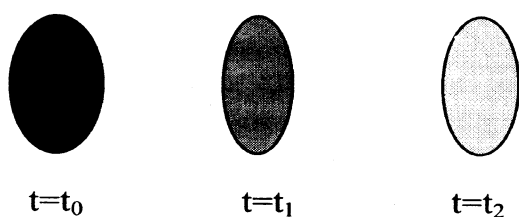


Figure 1: State of impure soul at different times. Intensity of shade shows degree of impurity.

The impurity, which is also part of the soul, consists of *kashayas* (passions), *ajnana* (ignorance) etc. and exists as some kind of virtual structure those changes with the level of impurity and time. The soul at any instant can be viewed as a composite of pure soul, or pure consciousness, and the impurity, or impure consciousness, which is also some form of the soul. We separate these two aspects of the soul as shown in figure 2, the shaded part represents impurity. It may be mentioned that the soul and the impurities are co-extensive and occupy the same space but for the purpose of illustration we have shown the impurity in different sizes just to show its magnitude. It may be noted that impurities are not spatially different from the soul and both are non-corporeal.

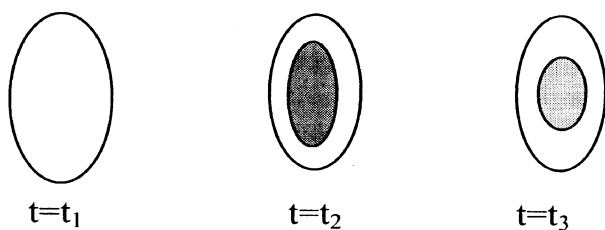


Figure 2: Soul and impurity at different times, size of impurity represents its magnitude and shade represents quality.

Technically, the impurities are *bhava* karmas. As karmas shed the impurities decrease, there is change in quantity as well as in quality. The pure soul being non-corporeal is non-doer it cannot perform any physical act. The source of all actions, mental, verbal and physical, is the impurities and so the impure soul is regarded as doer.

There are two ways to describe the existence of the worldly soul.

1. In the first kind of description distinction is not made between the soul and the impurities. The worldly functions, comprising mental, verbal and physical actions, are performed by the impure soul. The passions are also generated in this soul and it leads to bonding of karma, which changes the state of the soul. As a result the impure soul experiences continuous transformation as shown in figure 1.
2. In the second kind of description as shown in figure 2 the soul is separated from the impurities and it is assumed that the pure soul does not undergo above transformations in its state, the changes take place in the impurities only. This is implied to mean that the pure soul remains unaffected, the source is, and the changes are experienced by the impurities i.e. impure consciousness is the cause of changes and it also experience their effects. The passions are generated in the impure consciousness, and they affect the actions.

The first way of description focusing on modes of the soul is called the *vyavahara naya* or the empirical or relative view of describing the soul. In this approach the soul is the doer and experiences the consequences. The second way of description focusing on the unchanging soul substance is called the *nishchaya naya* or the absolute view of describing the soul. In this approach the pure soul is considered to be non-doer and non-experiencing the consequences, the acts of doing and experiencing the results of actions are ascribed to the impurities or the impure virtual structure of the soul. It may be noted that both views of the soul are real; they view the reality in a particular way. The second approach does help in conceiving the fact that at any instant the pure soul is distinct from its impurity and when all impurities are eliminated at some stage only the pure soul is left out, which is the liberated state. However it must be kept in mind that the impurities could not exist without the soul. Jainism believes that impurities are associated with the soul from the beginning less past and at no time in the past the soul was

without impurities. The second approach may sometimes lead to the erroneous impression that being non-doer the soul is not responsible for the worldly sufferings. Though the pure soul is non-doer the soul associated with impurities is a doer and performs the worldly functions and suffers their consequences.

Three kinds of states of soul are described in Jainism, *bahiratman*, external soul, *antaratman*, internal soul, and *paramatman*, the supreme soul. The external soul looking outwards is not aware of his real existence and in a state of illusion identifies him with the body (formed because of impurities), owns the external objects, animate and inanimate, in his possession and enjoys worldly pleasures, and pains, through senses and mind. The internal soul looking inwards realizes his real existence and regards the body as external and disowns the external objects. He knows that the worldly pleasures experienced through senses and mind are temporary and the real permanent pleasure is within. Such a soul makes efforts to remove the impurities that were causing the illusion. The supreme soul has eliminated all the impurities causing this illusion and has attained his natural state of unlimited bliss and perfect knowledge and perception.

The model presented in figure 2 helps in defining the three kinds of soul. In case of external soul the impure consciousness, impurities, is conscious of the impurities i.e. both the subject and the object are the impurities. The soul here in fact is in a state of illusion and identifies him with these impurities; he thinks that it is his real identity forgetting the real self. The soul not conscious of its real existence identifies with non-soul like passions, body etc. This is the lowest state of the soul. A particular view of this case can be compared with the materialistic view of life in which an organism is considered to consist of body only denying the existence of soul. The consciousness (impure?) then is assumed to be an emergent property; it emerges on combination of body matter and disappears on death, when the body decomposes. In this view of life the concept of rebirth and karma is not recognized.

In the case of internal soul either the impure consciousness is conscious of the pure soul or the pure soul is conscious of the impurities. Both these possibilities exist in the case of internal soul and one of them can occur at any one time. The soul in this case avoids indulging in malevolent acts, *papa*, and engages in performing benevolent acts and eradicating the impurities.

The supreme soul is conscious of itself all the time, i.e. both the subject and object are the pure soul. The soul knows that the body is different from him and the psychical impurities causing illusion having been removed there is nothing to

stop manifestation of the natural properties of the soul. In this state the soul is called *paramatman*. Two types of *paramatman* have been recognized in Jaina texts, *Arhanta parmatman* and *Siddha paramatman*. *Arahanta parmatman* is in embodied state, still having minimum biological impurities, and has destroyed all psychical karmas enabling him to experience natural bliss and manifestation of perfect knowledge and perception. *Tirthankara* is *Arahanta paramatman* who experiencing the absolute truth in all its aspects teaches his disciples and followers the reality of life and the world and the ways to achieve emancipation. *Siddha paramatman* is body-less and is free from all karmas and exists as pure *jiva* substance. In this case the soul is in its natural state and is free from influences of matter. On reaching this state the soul is never to have body again and he experiences all his natural attributes without any obstruction forever.

5 Powers of Soul

Samayasaar of Acharya Kundakunda is the most important philosophical work on soul having a unique and respectable position in Jain literature. In his Sanskrit commentary *Atmakhyati* on *Samayasaar* Acharya Amritchandra composed verses of great spiritual value. At the end of this book he mentioned 47 *Shaktiyan* (Powers) of soul. This short description presents some very important concepts of soul. I have meaningfully translated this text in English here.

The soul is known and identified through its *jnana* attribute. *Jnana*, a special attribute, is the identifying property of soul; it is not found in matter (*pudgala*) or in other non-living substances. Hence in order to know soul we must understand *jnana* first. As a substance *jnana* and soul are one and the same. Question then is why a distinction is made between them? This is because existence of *jnana* can be experienced and proved, soul cannot. Soul has infinite intrinsic (permanent) attributes; the other (perverted) attributes of soul, which may exist simultaneously or temporally, though different from *jnana* etc. are not different spatially. So change in one attribute causes a change in other attributes too. The other temporary attributes are also known as powers of soul. The *jnana* attribute is the means to establish contact with the self as well as with external world. Some attributes and powers may seem to oppose each other but they are properties of the same soul.

We now describe 47 rising powers and attributes of soul. These powers are intrinsic to soul and are not related to karma. The substance of soul is one with the attributes and powers and it does not carry the perverted modes of soul. But the 47 powers do include the relatively pure modes of soul which are produced by

aupsamika (subsidence) and *ksayika* (annihilation) states and *ksayopasamika* (annihilation-cum-subsidence) states with right faith. These powers gain prominence in pure modes of soul. A question may be raised that when pure modes of soul are included in the powers, why the perverted modes, which are also modes of soul and which occur in knowledgeable souls too, are excluded. The reason is that although this is true, the perverted modes are considered as weakness rather than power of soul. The attachment and aversion, found in ignorant by mistake and in knowledgeable by weakness, cannot be said to be aroused by powers and so the perverted modes are not counted as rising powers. These powers though distinct in character are mutually related and influence each other, so much so that their inter relationship is essential to maintain the given character of the soul, this kind of cooperative inter relationship among powers is a specialty of soul.

1. Life Power (*Jivatva Shakti*)

The existence of consciousness property of soul, which is its distinguishing character, is due to the life power. The life power is the source of 'life' in beings. In the mundane state the food is external auxiliary cause and the age determining karma is internal auxiliary cause for body, the life exists due to the inherent power of soul. Due to this power the soul lived, is living, and shall live forever.

2 Consciousness (*Chiti Shakti*)

Due to power of consciousness the soul never becomes non-living physical substance but remains 'soul', a sentient substance. The power of consciousness distinguishes soul from inanimate substances; it makes distinction between soul and body. The 'life' in a living being is just not due to union of soul and body, as signified by life power, but it exists as a manifestation of the consciousness of soul in the being. The *Chiti* Power is intrinsic consciousness property of soul, which is recognized externally by its life power.

3-4 Self-awareness and Intelligence Power (*Drissi Shakti* and *Gyan Shakti*)

The formless or general perception by soul is made by self-awareness power and perception of shape, size and particularity is due to the intelligence power. The self-awareness and intelligence powers are in fact manifestation of consciousness but they have distinct functions.

5 Bliss Power (*Shukha Shakti*)

The bliss power creates, and is identified by, favorable states of soul; the adverse states create pain. The favorable states are incorporated in the first four powers described above. Adverse states is not the property of soul, they are created by karma. The right faith and right conduct are included in the bliss power; wrong faith and wrong conduct are results of karma. The bliss power signifies that the real pleasure is intrinsic to soul, it is neither found in external objects nor in meritorious acts. Meritorious acts may lead to temporary pleasure but permanent bliss is an attribute of soul.

6 Spiritual Energy (*Virya Shakti*)

The ability of soul to create and retain its state is due to spiritual energy. A liberated soul (and Arihanta) has infinite perception, intelligence, bliss and spiritual energy as a result of full manifestation of these powers. The spiritual energy is different from and is not related to physical power of a being.

7 Almighty Power (*Prabhutwa Shakti*)

The soul is almighty, independent and capable of continued uninterrupted existence without any external assistance. All the infinite attributes and their states are vested with the almighty power.

8 Extension Power (*Vibhutwa Shakti*)

The extension power pervades all the powers of soul e.g. life power, consciousness power, self-awareness power, etc., and because of it other powers also pervade each other. This makes soul an indivisible power unit.

9-10. Power of Omniscience (*Sarva Darsitwa and Sarvagya Shakti*)

The power of omniscience is of two types defined in respect of self-awareness and intelligence. The self-awareness omniscience enables soul to have general perception of entire *loka*, cosmos, and the intelligence omniscience enables soul to have knowledge of all the objects in *loka*. These powers are somewhat similar, the first introductory contact with the object is awareness and its detailed observation is knowledge. A mundane soul first experiences awareness and then knowledge of the object whereas an omniscient or a liberated soul experiences both simultaneously. An omniscient is able to perceive and know, in minutest details, the entire *loka* and *aloka* (supracosmic space), past, present and future, at

the same time.

11. Cleanliness Power (*Swachhatwa Shakti*)

All objects of *loka* and *aloka* are reflected in soul at once due to its cleanliness power. Unlike a mirror in which only material objects are reflected, all objects, physical and non-physical, subtle or gross, in all their aspects including their properties, are reflected in the soul. The limits of time and distance do not apply to non-physical soul and all objects far and near, present, past, and future, are reflected equally (the temporal distinctions cease to exist). Just like mirror the soul is not contacted or affected in any way when objects of *loka* are reflected in it, both soul and objects continue to maintain their individual and independent identity. However, this happens only in a pure soul (Arihanta or liberated state). As the cover of karma reduces the reflective capacity of soul increases and it may develop capability of direct perception leading to powers of clairvoyance and mind reading in a gradual manner, ultimately gaining the capacity of total cleanliness power in Arihanta state. The reflection occurs in a natural way without effecting the peace and tranquility of soul in any way.

Irrespective of karma the cleanliness attribute is always present in some measure and the reflective power is never reduced to zero. The cleanliness power is also interspersed with all other attributes and powers, which, like cleanliness, never become extinct even with thickest cover of karma. Because of reflective power the soul having reflection of all kinds of objects, good or bad, remains pure and clean; soul in Arihanta state does not develop sentient feelings or emotions even if bombarded with insult and abuses.

12. Enlightenment Power (*Prakash Shakti*)

The soul has power of knowing the self and experiencing the self in all its aspects. This power is called enlightenment power. When this power is awakened the soul is no more dependent on external help for knowing the objects.

13. Power of Non-restrained Growth (*Asamkuchit Vikasatwa Shakti*)

The power of non-restrained growth allows soul to grow and develop unrestrained without bounds of space and time. All other attributes of soul like *chetana*, self-awareness, intelligence etc. attain their full development in space and time because of this power.

14. Power of Non-interference (*Akaryakaranatwa Shakti*)

Due to the power of non-interference the soul is neither a cause of others nor any external object is a cause for itself. The substance and attributes of soul are intrinsic and have no external cause. External factors have no direct role in the changes in the states of a soul; they may act as auxiliary causes. Similarly the changes in external objects take place due to their own causes and soul has no role in it. The concept of non-interference is very important to understand the changes taking place in soul, which are caused by soul itself and there is nothing else, including body, to cause it.

15. Transformations and Transforming Power (*Parinamya-Parinamaktwa Shakti*)

Due to transformation and transforming power the soul perceives external objects and is cognized by others without becoming a cause for changes in either of them. The soul knows the self as well as the external objects and also becomes an object of other's knowledge. Thus soul knows the self, knows external objects, knows that others know him, and is known by others.

16. Power of Non-transference (*Tyagopadan Shunyatwa Shakti*)

The power of non-transference makes soul just complete, not more or less than that required for its existence. Soul needs nothing to add or reject for its complete existence.

17. Power of Subtle Changes (*Agurulaghutwa Shakti*)

The soul has the power to make subtle changes without losing its attributes (and character). The changes take place in six steps- infinitesimal, by countless fractions, by countable fraction, numerable times, innumerable times and infinite times, in increasing or decreasing order. Such subtle changes are characteristic of not only soul but also of other real substances, physical and non-physical.

18 Power of Creation-Destruction-Persistence (*Utpada-Vyaya-Dhruvatwa Shakti*)

Soul experiences continuous changes due to its power of creation-destruction of modes and persistence of substance. Soul does not need help of any other object for changes in self. The power of creation-destruction-persistence is also a characteristic of other substances like *pudgala* (matter) etc.

19 Power of Continuity (*Parinama Shakti*)

Creation and destruction (of modes) may produce states of opposite nature in soul but such states maintain a relation between them due to power of continuity so that a substantial permanence is assured. The power of continuity permits creation and destruction of states preserving a relation and the essential character of soul.

20. Non-corporeal Power (*Amurtatwa Shakti*)

The soul and all its states are non-corporeal due to non-corporeal power.

21-22. Powers of Non-doing and Non-experiencing (*Akartritwa Shakti* and *Abhoktritwa Shakti*)

The soul in the absolute sense is non-doer and non-experiencer of acts other than intelligence acts (referring to the acts of the soul in general described by the term 'gyan bhava'), i.e. the soul is non-doer and non-bearer of acts of attachment and aversion (from the absolute point of view), which are perverted modes and controlled by karma.

23 Power of Inertness (*Nishkriyatwa Shakti*)

The soul free of karma is inert, it has no vibrations. Vibrations-less state is an intrinsic quality of soul.

24 Power of Constant *Pradesha* (*Niyatpradeshatwa Shakti*)

Soul always has (mathematically) the same number of innumerable *pradesha* (space units), which are equal to the number of *pradesha* in the *loka*. The mundane soul occupies the space of the body, it contracts or expands according to the size of body, during which the number of *pradesha* remains unchanged. This is also true for the liberated state when the volume is supposed to be little less than the volume of the last body possessed by the soul.

25 Power of Confinement to Self (*Swadharmavyapapakatwa Shakti*)

The soul confines to itself and does not extend in the body, though it occupies a space equal to the size of the body but soul does not extend in the body. The soul confines to its own attributes and never extends in the attachment

and aversion attributes of karma or in the material and fiery bodies.

26 Power of Common, Special and Common-cum-Special Attributes (*Sadharan-Asadharan-Sadharanasadharana Dharmatwa Shakti*)

Soul has common attributes (e.g. existence), which are also found in other substances. Soul has special attributes (e.g. intelligence, self-awareness, bliss, etc.) which are exclusive to soul. Soul also has some attributes, which are common to some (not all) non-physical substances (e.g. non-corporeal power of soul is found in dharma *dravya* but not in *pudgala dravya*).

27 Power(s) of Infinite Attributes (*Anant Dharmatwa Shakti*)

Soul has power to possess infinite attributes.

28 Power of Opposite Attributes (*Viruddh Dharmatwa Shakti*)

Soul can have attributes of opposite nature.

29-30 Powers of being Self, and Power of not being Non-self (*Tatwa Shakti* and *Atatwa Shakti*)

Due to power of being self the soul has attributes of own substance and due to power of not being non-self the soul does not have attributes of other substances. It cannot act and function like matter or other non-physical substances e.g. *dharma*, *adharma*, *akasa* (space) and *kala* (time). All changes in soul are confined to its own attributes and forms; it never assumes the attributes and forms of other substances. The soul always bears intelligence, awareness, bliss and self-power attributes and does not possess attributes like attachment and aversion, etc.

31-32 Powers of Oneness and Multiple-ness (*Aikatwa Shakti* and *Anektwa Shakti*)

Soul assumes many different modes and forms but its basic nature as a substance remains unaltered due to the power of oneness. Further, soul as a substance remains one but assumes different modes (forms) due to the power of multiple-ness.

33-38 Powers of Existence, Non-existence, etc. (*Bhava Shakti*, *Abhava Shakti* etc. *Chhaha Shaktiyan*)

- Existence of the present state at this moment is due to the power of existence (*Bhava Shakti*).
- Absence of states other than the present one at this moment is due to the power of non-existence (*Abhava Shakti*).
- The present form shall cease to exist in the next moment due to the power of the non-existence of the existing (*Bhava-Abhava Shakti*)
- A new form (which is not existing at present) of the soul will appear in the next moment due to the power of existence of the non-existing (*Abhava-Bhava Shakti*)
- At a given instant, the soul assumes only that form which can occur as per definite rules. This is due to the power of existence of exist-able (*Bhava-Bhava Shakti*)
- At a given instant, the soul cannot have the form which cannot occur as per definite rules. This is due to the power of non-existence of non-exist-able (*Abhava-Abhava Shakti*).

All changes take place in the soul due to substance of soul only; no other substance has a role in these changes. The change in the form of soul follows the rule of karma and such changes are un-avoidable and nothing can stop it.

39-40 Power of Self-Existence (*Bhava*) and Power of Action (*Kriya*) (*Bhava Shakti* and *Kriya Shakti*)

The power of self-existence (*bhava*) refers to the ability of soul of existing in the self without external interference. It may be noted that *bhava shakti* described at serial number 33 refers to the existence of the states of the soul whereas *bhava shakti* here refers to the existence of the soul itself. The power of action (*kriya*) refers to the power responsible for (the activity of) creation of pure states of the soul.

In next six types of powers we shall see the six ways in which the soul affects such creations. We shall see that the pure states are created by the soul (*Karta Karak*) to the soul (*Karm Karak*) by the soul (*Karan Karak*) for the soul (*Sampradan Karak*) from the soul (*Apadan Karak*) and in the soul (*Adhikaran Karak*). The six act-related factors, *Karaks*, referred to here are defined as follows:

- One who performs the act is *Karta*
- The process of the act is *Karm*
- The means of doing the act is *Karan*
- Beneficiary of act is *Sampradaan*

- The source 'from' which the action originates is *Apadaan*
- The base of act is *Adhikaran*.

41-42 Karm Power and Kartritwa Power (Karma Shakti and Kartritwa Shakti)

Out of the above mentioned six *Karaks*, the powers corresponding to the first two are;

- * The soul is the object of its own pure states due to *Karm* power
- * The soul is the doer of its own pure states due to *Kartritwa* power

43 Karan Power (Instrument Power) (Karan Shakti)

- * The soul is the instrument in creation of its own states due to *Karan* power

This principle means that all acts like penance, rituals, merits, demerits, etc are not the main cause of liberation, they are 'instrumental' in elimination of karma.

44-45 Sampradan Power and Apadan Power (Sampradan Shakti and Apadan Shakti)

- * The soul is the beneficiary of the creation of the pure states (of soul) due to *Sampradan* power

- * The soul is the source of creation of pure states (of soul) due to *Apadan* power

That is, all acts originate in soul for soul and for none else. Attributes like intelligence, self-awareness, and bliss belong to soul for his self-enjoyment. These neither originate elsewhere nor can be transferred to others.

46 Adhikaran Power (Adhikaran Shakti)

- * The soul is base for his pure states due to *Adhikaran* power.

The soul transforms his states in general, and from the mundane state to the liberated state on total elimination of karma in particular, due to *Adhikaran* power.

47 Power of Ownership (Sambandha Shakti)

Soul is the natural owner of the self, it owns no one else and no one else owns the soul. Soul is responsible for his acts. Generally, the term ownership

implies that one is owner of some object other than the self. Here ownership indicates that soul is master of own self and is not property of any one else; soul is not master of anything other than the self; it does not own any property. Soul owns his pure states. Soul is complete and independent self and is not dependent on external world or external power for its function.

The above description of powers of the soul provides a glimpse of the real powers of the soul. The soul possesses powers with which it manifests in various ways to manage own states as well as the body through karma in the mundane state and yet it remains unadulterated and does not contract the properties of matter. The perverted modes of aversion and attachment are counted as weaknesses and not as rising powers of the soul, these karma based modes disappear on elimination of karma. The soul and body are exclusive to each other; they transform by their own powers and laws and appear to maintain a relation by the principle of parallelism so that changes in one are correspondingly reflected in the other without interchange of the attributes of one another. Both soul and body have independent existence yet the 'life' is the result of their combination. The infinite attributes and powers of the soul make the 'life' in multiple forms and in multifaceted and multi-dimensional aspects possible.

In conclusion, we note that the soul is *chaitanya*-self (possessed of consciousness) having persisting attributes, successive modes and infinite powers and attributes and is never extinct of its primary identifying character, the intelligence, self-awareness, bliss and spiritual energy.

6 Consciousness

Consciousness, according to Jainism and most other philosophies, is a property of the soul. Consciousness, and hence intelligence, in no case can be a property of insentient matter. The concepts of emergent property, or epiphenomenon, that consciousness emerges from matter (or brain) are fundamentally misunderstood. This materialistic approach stems from the assumption that every truth is empirically verifiable. According to Jainism some truths, including the absolute ones, are only experienced. The universe consists of two kinds of substances physical and non-physical; the non-physical substances can be verified by inference only and cannot be measured empirically.

Another concept analogous to consciousness is awareness. Awareness is defined as the state or ability to perceive, to feel, or to be conscious of events, objects, or

sensory patterns. In this level of consciousness, sense data can be confirmed by an observer without necessarily implying understanding. More broadly, it is the state or quality of being aware of something. In biological psychology, awareness is defined as a human's or an animal's perception and cognitive reaction to a condition or event. Awareness may be focused on an internal state, such as visceral feeling, or external events by way of sensory perception. Awareness provides the raw material from which animals develop qualia, or subjective ideas about their experience.

Soul and consciousness in Jainism refer to the same entity and one is meaningless without the other. Jain philosophy describes soul in great detail and deals with the methods and processes of its purification.

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1. Introduction:

Recently a historical and amazing incidence took place in Ahmedabad, Gujarat, India. A gentleman called Shri Hira Ratan Manek(H.R.M.) aged 64 , a mechanical engineer residing at Calicut, originally belonging to Kutch., Gujarat, has just accomplished a remarkable record- a world record, by doing continuous fasting for 411 days, as per jain tradition.(i.e. taking only boiled water during day time and just no other food or liquids). He had done similar jain fasting for 211 days in 1995-96. This time, he started fasting on 1.1.2000. The unique thing, was that this time he was under continuous day to day medical checking and elaborate medical testing- with a critical evaluation by a team of expert doctors, representing various fraternities of medical science including family physicians, physicians, cardiologist, neurologist, endocrinologist, surgeon, pathologists, genetician, radiologists e.t.c. Also from time to time several teams of physicists, chemists, biochemists, physiologists and several doctors from all different specialities from India as well as abroad have spent time to meet him, examine him. All of them have been impressed with the genuinity of fasting but every body is wondering how this has become possible. You will agree, that as per today's scientific knowledge, this is just not possible and it is extremely difficult to explain this happening, even if the man is taken as superman or genetically a different human being. We now know of about atleast 200 people living without food , on this earth. The author of this hypothesis, was also the part of medical team and must have met and examined him several times during his unique fasting. The author also ,like any scientist had real sceptic behaviour towards this gentleman and had really taken this gentleman to toughest and most critical – analytic check(keeping in a nursing home more than a month, isolating him in a cube , not allowing any of his relative to stay with him etc) and all other doctors also had scrupulous checking. All of us are fully convinced about the genuinity and really are wonderstuck. Having satisfied fully with the genuinity , the team

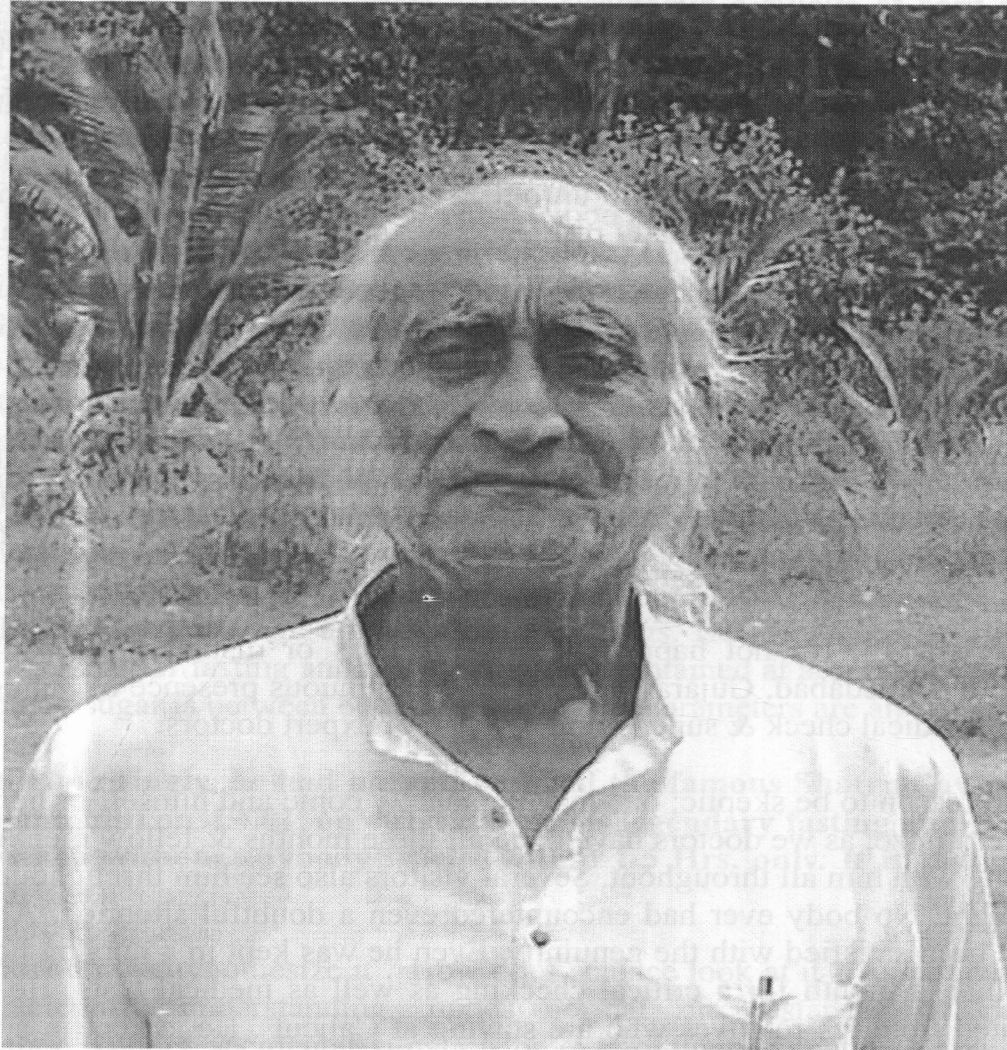


Figure 1. Shri Heera Ratan Moti (HRM) age 64 years remained on water and energy from Sun for 411 days.

suddenly realized that the ball was in the cot of doctors- as now they had to explain, how this gentleman could do this and that too like a normal man he talks a, moves around, meets people, gives lectures and talks intelligently and quite logically i.e. all his systems are normal including cognition. Ultimately, the job was left to the author to try to hypothesize something. The author had accepted it. But he realized that he was in deep waters. Its one the most difficult tasks, he had

ever had in the past. Really speaking, this is a subject of occultism and spiritual science, and hence our experimental science had natural limitations. So the author has tried to evolve a hypothesis, which starts with logic, then available scientific knowledge is applied and ultimately again logic leading to “Speculative VISION” is applied. Hence, he does not claim that things presented here are all the way scientific, but he assures you a great experience, opening up “the dialogues” and assures that you will have a chance to examine several fantastic possibilities. Who knows truth may unfold itself in coming years, from these possibilities. The author has already received several queries from internet, after floating it on the same

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THE HYPOTHESIS

This is indeed unique. You will agree that such a prolonged continuous Jain fasting for religious (Spread of Ahimsa and other high mottos) & scientific purposes (to create awareness about Sun-energy) & also aimed at solution of four way human crisis (Physical, Mental, food & neurological) under scrupulous daily medical supervision is unheard of. It's just fantastic, and absolutely amazing, but this is not a myth. It's not happening in Himalayas or distant jungles; it is happening in Ahmedabad, Gujarat (India) in the continuous presence of public & under strict medical check & supervision by team of expert doctors.

There is no reason to be skeptic; one may personally come and himself or herself check & scrutinize; as we doctors have done all these months & fellow men have been staying with him all throughout. Several visitors also see him throughout the day and night. No body ever had encountered even a doubtful situation. All of them have been satisfied with the genuinity. Even he was kept in a nursing home for more than a month for a critical checking as well as medical tests. He has been isolated from his relatives who are staying at Calicut . He is kept in a two room flat, which is totally devoid of any kind of food.

Several doctors from India, Gujarat, Ahmedabad and abroad have from time to time examined and are unable to explain the scientific basis from current clinical knowledge, while declaring the genuinity of fasting. A team of medical doctors have supervised (medical examination as well as laboratory tests) throughout these fasting. This comprise of Dr. Sudhir Shah M.D.,D.M.(neuro), Dr. Nalin Gheewala M.D., Dr. Viresh Patel M.D., Dr. Navneet Shah M.D.(Physician and endocrinologist), Dr. K.K.Shah M.S. Gen.Surgery, Dr.Kalpesh Shah M.D.Radiologist, Dr. Gaurgey Sutaria Radiologist, Dr. Jayesh Sheth, Dr. P G.

Shah, Dr. Prakash Doshi , (family physician) and several others.

Today, it is 411th day of Shri Hira Ratan Manek's fasting. (on Dt. 14th February 2001) He started fasting from 1.1.2000. He is on total fasting as per Jainism. He is consuming only boiled water daily between 11 a.m. to 4 p.m. only and no other liquids and just no other food, No I\V or I\M injections. Medical checkup commenced few days before fasting programme & is continued till to day. It consists of daily written record of pulse, blood pressure, respiration, Temperature, water intake, urine output, weight etc. Relevant Hematological and biochemical (basic and few advanced) tests are done periodically i.e. monthly or fortnightly. ECGs are taken regularly. Ultra Sonography, EEG, CT.Scan and M.R.I. Brain have been taken at the end of one year and a team consisting of general practitioners physicians, surgeons, Cardiologists, endocrinologist and a neurologist have been examining him regularly and periodically from first day of fasting. Except for loss of 19 Kg weight, (Which is now stable with no further weight loss for last 3 months) a slight reduction of pulse rate and B.P. and definite reduction of respiratory rate (from 18 to now 10/minute) amazingly, there is no other medical abnormality. Even the brain and mental capacities are absolutely normal. There are hardly any findings. He has stopped passing stool after 16th day of fasting and urine output is maintained at around 600 to 800 c.c. His blood sugar is between 60 to 90. Rest of the parameters are all normal.

Most surprisingly, he had himself climbed the famous Shatrunjay mountain (Palitana hill) on 4.4.01, on 401st day of his legendary fasting along with 500 fellowmen without anybody's help, within 1.5 Hrs. only. It is just amazing. Isn't it ?

But how do we hypothesize it ? How does science look at it ? As per our present day scientific understanding, under normal circumstances of prolonged starvation, (under accidental situation or extraordinary situation,) human being loses weight fast. First carbohydrate is utilized. Then ketones appear in urine in first week. Then proteins are burnt. Later fat are mobilized from body stores and used. Before that, the person becomes dull, lethargic and irritable, his logic and reasoning fails and vital parameters fall and within 8 to 10 weeks, as per science, the physical existence will be challenged.

Here, there has been no such ill effect. How do we explain this ? How does his energy mathematics work? How he is still so intact with normal intellect, normal mental function? So far, there is no solid thesis (as this is the first event in the world, under medical supervision), there has to be some logical, scientific

hypothesis. It explains quite a bit, but also leaves few questions unanswered, for all of us to further analyses. It also opens, at the same time, several new avenues for the coming time to work upon it. (e.g. issue of obesity, the possibility of cosmic energy, the functions of pineal gland).

Here, we propose a hypothesis which has four basic steps to explain energy-metabolic mathematics. i.e. (1) Reducing calorie requirement by chronic adaptation. (2) Deriving basic energy from cosmic sources-chiefly, 'sun energy'-solar energy. (3) Utilizing the energy in the efficient way and recycling the same in his own body. (4) Genetically or phenotypically a different body dis-position.

Let us discuss the proposition step by step.

(1) Chronic Adaptation Syndrome : As the body and the mind adapts to chronic stress in a healthier way, as compared to acute stress, similarly body's adaptation must be different to chronic fasting (beyond 30 days) as compared to acute fasting (e.g. 3 to 15 days.) No body knows which is the exact point, where body adapts chronically, but 30 days sound reasonable time though it may vary individually. This is some kind of hibernation.

The routine calorie mathematics sounds logical and applicable to acute fasting where carbohydrates break up first, ketones appear in urine and weight loss starts; fat is burnt and muscle mass reduces and vital functions and mental capacity may start slowing down. Thus in acute fasting, energy dissipated must come from stored sources of body to match 1:1 ratio of calorie consumption against utilization.

In chronic adaptation; the metabolism of body must slow down. The body needs are reduced to the minimum. This is possible by down regulation of cellular and receptor function, altering the energy metabolism to the lowest possible extent. Oxygen and water are supplied to cells as basic things, At this stage, the hunger centre will become depressed and satiety centre will be activated. So there will not be any feeling of hunger or food craving. Here hypothalamus(the master of automatic nervous system and the organ of behavior) plays an important role.

It may be possible for such an individual to do routine activity with very low amount of energy or calories as 500-600 calories, to sustain cellular metabolism. In truly hybernating animals and human beings, the energy need may go down further. Thus depending upon the activity of the individual, the energy must be

provided.

At the cellular level, mitochondria may play a vital role in energy storage by proliferation. Other organelles of the cell may also help in the process of chronic adaptation.

(2) Deriving Energy from Cosmic sources - Solar Energy :

Whatever low amount of energy, that is required, must come from some source. He is only on boiled water-which as per science is having hardly any caloric value. or does it really supply some energy ? He doesn't take any type of food or liquids except boiled water. So to run the cellular metabolism and to perform daily activities, he must be deriving energy from surroundings. He is living on earth, where he is exposed to the Sun, Earth, Water, Plants and human beings and other living animals. These are the options available to him. We will call these, cosmic sources of energy.

So most likely, he is drawing energy from these cosmic sources - Cosmic energy. Hence more correctly it is energy mathematics rather than calorie mathematics; a concept worth understanding. Out of all cosmic sources, The SUN is the most powerful & readily available source & has been used for energy, by sages & rishis since ancient time, including lord Mahavir, Tibetan lamas & other Rishis. The solar energy has two components: the light and the heat.

Mankind is also using solar energy for running solar cooker, solar heater, solar car through solar batteries etc. Similarly Shri Hira Ratan Manek(H.R.M.) has almost converted him self in to a kind of a solar cooker and has solar batteries activated in himself. The solar energy has two components, the light and the heat (temperature) Luckily India has a rich potential to become superpower as we have a constant availability of solar energy, all throughout the year.

How then SUN energy is received ? The Brain & the mind are the most powerful recipients in human body. The retina & the pineal gland (The third eye or the seat of soul as per Rene Descartes) are equipped with photoreceptor cells & may be considered photosensitive organs.

The method practiced by Shri Hira Ratan Manek : He suggests to look at the rising sun daily, with naked eye and without blinking the eyes, as far as possible. To look for a few seconds initially and then every week to increase by few few seconds to ultimately reach up to several minutes. Eyes and specially retina must

be healthy.

As plant kingdom thrives on chlorophyll & photo synthesis, directly dependant on the Sun, similarly some kind of photosynthesis or photoanalysis must be taking place; when we hypothesize Sun energy .Through complex ways & distinct pathways this energy must enter the body. Is it a direct entry in to the physical body or it enters through auras of human body (please refer karalean photography)is yet to be examined. It is quite possible that human aura plays a modulating role for allowing this energy, in to the physical body.

There is a pathway from the retina, to the hypothalamus, called the retinohypothalamic tract. This brings information about the dark & light cycles to supra chiasmatic nucleus (SCN) of the hypothalamus. From the SCN, impulses along the nerve travel via the pineal nerve (Sympathetic nervous system) to the pineal gland. These impulses inhibit the production of melatonin. When these impulses stop (at night or in dark, when the light no longer stimulates the hypothalamus) pineal inhibition ceases, & melatonin is released. The pineal gland (or the third eye) is therefore a photosensitive organ & an important timekeeper for the human body. The unexplored process of energy synthesis & transformation from the sun energy perhaps partly occurs here : While going through the details of recent scientific literature & also comparing it with ancient Indian spiritual texts, as well as Western occult & new age, following things are apparent.

The activation of pineal gland is the key step in psychic, spiritual & energy transformation processes. Here in this gland, energy processing & re distribution might be taking place. Pineal gland is the subtle commander of all endocrine glands, therefore controlling the humoral system. Through secretion of melatonin, it also regulates the circadian rhythm, sleep wake cycle & it also slows down aging process. It has psychic properties & is the seat of soul or mind - so called the third eye. (Possibly that is why Tilak is done in the forehead- in front of pineal and yogis do meditation with closed eyes, concentrating in between two eyebrows.

It is the Ajna (Ajna) chakra of tantrik system. Its activation can be done with prolonged yoga & meditation techniques or through practice of solar energy. The later does not use classic yoga steps.

As per recent research in animals; Pineal gland also inhibits growth & metastasis of some tumors. It has a stimulatory effect on the immune system. In birds &

other animals, it has a magnetic material & is therefore the navigation centre in birds. Scientists are looking at magnetic, navigatory properties of pineal gland in humans. Further, through the secretion of serotonin, it is involved in psychic experiences, synaptic transmission and several unknown powerful occult powers. A lot of research is required to validate this though some initial studies have already supported this view e.g. the chemical structure of LSD(a drug used for psychic experiences)is similar to serotonin.

So pineal activation and charging through solar energy is the vital step & that is the doorway of energy highway. This may be kundlini shakti activation, in other words.

Normal Pineal gland measures 6 x 8 mm in human body. As per C.T.Scan & MRI Scan reports of Mr. Hira Ratan Manek. it is 8 x 11 mm. (enlarged !) This may indirectly support the important role of pineal gland in energy transformation. However it is not necessary that anatomic enlargement always reflects hyperfunction . The increased hormonal secretion i.e. melatonin and serotonin levels should also be measured. Even without anatomical enlargement, there can be hyperfunction. Then we should study the pineal size and hormonal level in all psychically and spiritually evolved people or all people with extraordinary capacities.

Ever since mankind has started ignoring the psychically & Spiritually equipped pineal gland it has fallen on merely physical-material plane & therefore endless pains have fallen on the mankind.

Mankind must now relearn to activate pineal & the other psychospiritual bodies either through cosmic energy dynamics or through practice of Rajyoga or the Tantrik ways or other such practices.(One can imagine that high voltage energy transmission through shaktipat as occasionally yogis do to transfer energy in to their esteem disciples may be utilizing pineal gland or similar bodies) Kundlini Shakti is said to be activated through these & happiness & bliss with peace are bound to follow.

This solar (light and heat) energy may be transformed into electrical, magnetic or chemical energies in body. Once processed, this energy must be transported & must be stored somewhere. Actually the ultimate form of all energies is light. Energy & light can be transformed in to matter & back again to energy.

Hypothalamus is the commander of autonomic nervous system & Pineal gland is

in proximity to hypothalamus and is connected to it through autonomic nerves. So it is logical that new energy transportation may either activate this system or it may use this system as vehicle. Parasympathetic nerves & its hormones & chemicals may be more useful than sympathetic system. As sympathetic system increases body needs (e.g. thinking, fighting stress, excitement etc.), parasympathetic system is known to reduce the energy needs. It keeps the person serene & at mental peace and alters the metabolic requirements to a lower state & puts it to sleep. We can also hypothesize that there may be other hormones or chemicals too, involved in this complex energy transportation system. It is well known that pituitary and pineal glands are well connected through regulatory hormones and nerves. While pituitary gland expresses and controls physical body, we have seen that pineal expresses and controls mainly mental and spiritual bodies. Thus intricate balance and harmony between the two glands is very crucial point in the total (physical, mental, Emotional and spiritual) health or wellbeing of a human body and it must be any way achieved.

The role of temporal lobe & limbic system also may be important. It may work as a regulator, if not receptor and may be psychically involved in directing the energy in proper pathways. Deep into the limbic systems or in the parts of medulla oblongata, this energy may ultimately be stored & from time to time, may be recalled, charged or recycled. Medulla oblongata has all vital centres & therefore can be proposed as store of vital energy.

Thus there are energy receivers or receptors, processors, analyzers, modulators, transformers, transporters, stores (organ or bodies) etc. to explain the energy logistics.

As this form of energy mathematics is different from what we conventionally are used to, in form of food & calorie mathematics; we will call this food as microfood or mind utilization food (Manobhakshi Aahar).

Here, we have discussed about the Sun energy, but one may learn to use any source from the cosmos, ie. Air, water, plants, earth, living humans, animals etc. This may be called Surya vigyan, but equally there is Chandra vigyan and Vanaspati vigyan as mentioned in our ancient texts. Also apart from the retina & the pineal gland, skin & other senses may also be responsible for receiving energies from these different sources. In short this opens up, tremendous possibilities, which will need a very sincere effort from us to crystallize and to practice it for welfare of the mankind.

This micro food can solve, food crisis on earth & in fact is the only possible food

in present context for somebody who wants to be a long-term space traveler or planet traveler. Amazing! It is time to note that our routine food is not the only source to sustain the body.

The role of mind :

What ever said, in this step, (i.e. the step II of deriving the energy from the sun & transforming it in body.) the mind may be playing the crucial role. It is well known that the mind has enormous capacity, (The soul has even further or infinite capabilities). Through Sun Tratak & Meditation, tremendous capacities are attained, which will bring tranquility to mind and also slow down metabolism, as mentioned in step I. Mind can do every thing including so called miracles. It can revitalize body, it can heal diseases, it can know things in advance & it can manipulate laws of physics. The phenomena of telepathy, reading somebody's thoughts/ teleporting the things, bending the items, all are very well known examples of human mind capacities. If a strong mind decides to do unusual fasting, it can certainly do. It is unclear till this date whether mind is a separate entity or the pineal gland it self. According to some, each cell has mind and thus in other words mind is a diffuse electromagnetic and biochemical continuous process and one thing is clear, that out of all body organ, mind has a direct access to cosmic energy. Our mind is an invagination or outpouching of cosmic mind and cosmic energy and pineal in that case would be the knobimportant hub of the mind.

The faith & blessings from Yogis & Gurus have their own roles in sustaining oneself in adverse situations. On religious days, under high spirits & a cultivated atmosphere, a few people surprisingly do unusual things; like walking on fire or piercing pointed swords, through their bodies without damaging themselves. On similar lines, if some one does fasting, these blessings and faith may help to pull one through the period of physiological problems; till one enters chronic adaptation phase.

(3) Energy Economy in efficient ways and re-cycling the energy in his own body:

Those, who are chronically deprived of energy, learn to utilize the available energy in more efficient ways - so that even at the low energy state body metabolism and vital functions including nervous system do not suffer. This is quite logical & one can imagine this happening in the individuals caught in natural calamities, or those left alone in the sea or survivors of high altitudes after

plane crash etc... managing to live for several days or weeks, without food.

Also, one can hypothesize that these people may be recycling the energy in their own bodies. This may be done, through complex mechanisms, involving neural & humoral organs. Solar energy, dissipated through body may get absorbed into the earth & while walking bare footed on the soil, standing in the sun, may help absorbing this energy through skin of toes, sole of feet; as Shri Hira Ratan Manek does regularly & always preaches to do so to recycle the energy. This may be related to the principles of acupressure or reflexology.

(4) Genotypically or phenotypically a different body predisposition :

We should also examine this aspect carefully, as this leaves scope for an important discussion - whether each & every individual can use sun energy & if so, how efficiently?

Only time can answer this. But it is possible that each individual has a different genetic code and also each body has different physical capabilities. Hence, one may be able to receive this Solar energy more readily, can transform & store it in a better way & also can utilize more efficiently & even recycle it - while other person may not be able to do it to the same extent.

Hence, scientific experiments must be taken up, if possible on a randomized base upon volunteers with control population. However, leaving such study aside for the time being, it is possible that many people can do this experiment very successfully under supervision. Prior body Checkup & particularly retinalophthalmic checkup is mandatory and under strict medical guidance, a graded time bound experiment upon volunteers may be taken up.

Other possibility is that, we can use gene-cloning technique. By preserving the celline of Shri Hira- Ratan- Manek, we can clone him or use his gene for gene transfer therapy.

Whatever we do; use cloning or train the whole mankind, it can change the destiny of mankind. First of all, the food crisis will be solved. Through activation of this supreme energy in body & transforming it in electrical, chemical & magnetic forms, person can not only enjoy a state free of diseases but can gain positive health with a vibrant aura. His luster can impress even enemies & enmity may dissolve. His psychological disease can disappear. With improvement of mental & intellectual capacities one may be able to use brain power upto 90 to

100 %, as against to 3 - 10% as we normally do.

There will be reign of peace & prosperity. As there is no food, the bad thoughts and ill feelings will be stopped, so eternal peace is bound to follow.

This will also question the routine calorie mathematics.

This challenges the common calorie based science. Its limitations are highlighted. At the same time the complex issues of obesity & malnutrition can be readily explained through the concept of solar and cosmic energy. It is possible that obese people , though not eating excess food, still receive energy from cosmic sources, unknowingly explaining their obesity.

The concept of cosmic energy can be used thus for total uplift of mankind at physical mental, intellectual, emotional & spiritual levels. It has tremendous applications. One can utilize it, the way he can. Extensive scientific research work therefore should be immediately taken up, by appropriate authorities, including bioscientists & medical personnel, to answer all these issues. Awareness of all human beings must be created simultaneously and all those who are interested should work on this highly potential and fascinating project, of cosmic energy as well as potentialities of the pineal gland and other related issues discussed in these pages.

Ref. case study of Mr. Hira Ratan Manek : 411 fast :completed on 14.02.2001 and parna was done on 15.02.2001 in presence of about a lakh people with graceful presence of Jain sadhus, several Hindu saints, H.E. the Governor of Gujarat, respected Mayor of Ahmedabad and several other highly placed people.

**<11>. Can a person live without food and water for 75 years:
A Case Summary**

Dr. Sudhir Shah, MD, DM (Neurology)

**(Consultant Neurology at Sterling Hospital, Ahmedabad and
Head of Research Committee)**

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A 76 years old male, Prahladbhai Jani (Chunriwala Mataji), gives a detailed description about his life. (Now he is 87 years old). He left home at the age of 7 years and wandered in the jungles of Mt. Abu, Girnar, Narmada, etc. At the age of 11 years he had some supernatural experience and this changed his life. According to him he has no desire to eat, drink liquids or pass urine or stool since then. He had been physically fit. Almost daily he goes in a state of extreme bliss (Samadhi) where he experiences enormous light and strength. He attributes his strength to an elixir coming out through his palate.

He has studied up to 3 standards & knows to read and write with limited abilities.

According to him he did not speak for about 45 years (Maunbrat). In 1942 he was taken at J.J. Hospital and was under care of doctors & police for 45 days. One and half years back he was investigated by Dr. Sudhir V. Shah for initial analysis of his state of health. He has no past history of any major illnesses, hospitalization [save 1942 for observations], major or minor surgeries or drug intake. Mr. Jani accepted to undergo all non invasive procedures and blood investigations but refused for any invasive procedure from the beginning. He never wanted anything to be introduced through anyway to his body.

It was decided to study him by a panel of doctors, which included

Dr. Sudhir V. Shah (Consultant Neurophysician, Sterling Hospital/Associate Professor of Neurology at K. M. School of PGMR, Ahmedabad) Dr. Urman Dhruv (Physician & Secretary of Association of Physicians of Ahmedabad (APA))

Dr. V. N. Shah (Diabetologist, Director-Sterling Hospital) Dr. Bharat Gadhavi (General Surgeon/Medical Superintendent-Sterling Hospital) Dr. Kandarp Parikh (Urologist) Dr. Dinesh Patel/Dr. Hemant Patel (Radiologists) Dr. Sanjay Mehta (Neuro Radiologist & Sonologist) Dr. Gargey Sutaria (Radiologist) Dr. Sanjiv

Haribhakti (G. I. Surgeon) Dr. Navneet Shah (Physician, Endocrinologist) Dr. Prakash Darji/Dr. Sonal Dalal/ Dr. Pankaj Shah (Nephrologists) Dr. Bansi Saboo (General Physician) Dr. Shrenik Shah (Cardiologist) Dr. Dhanesh Patel (General Surgeon) Dr. O. M. Modi (Senior Physician) Dr. Hemang Desai (Psychiatrist) Dr. Jayesh Sheth (Genetician & Endocrinologist) Dr. Dhaval Modi (Ophthalmologist) Dr. Jayeeta Chaudhary (Dietician) Dr. Mukesh Patel (Pulmonologist) Dr. Ruchir Shah (ENT Surgeon) Dr. Sanjiv Shah (M.D. Pathologist) Dr. Sandip Shah (M.D. Pathologist)

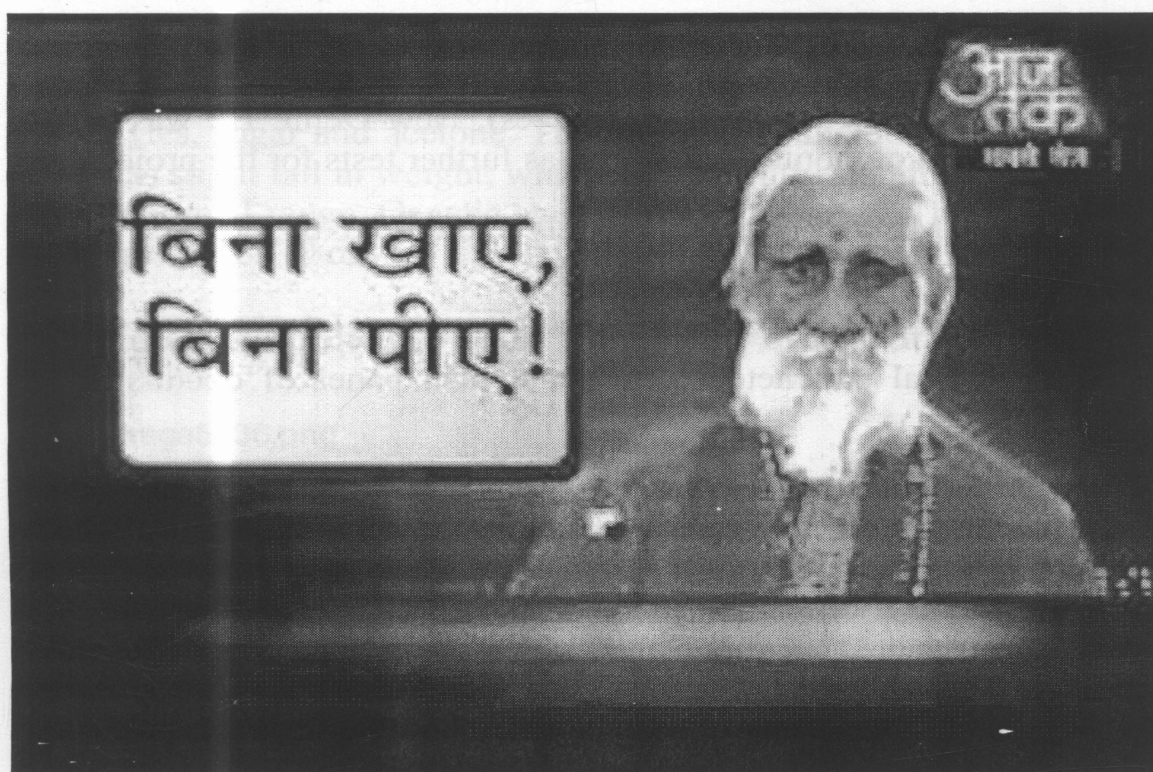


Figure 1. A TV channel in Hindi showing a photo of Shri Prahaladbahi Jani, popularly known as “Mataji”, who claimed to have not taken any food or water from last 75 YEARS.

Several other doctors also examined him from time to time. He was kept in Sterling Hospital (Gurukul Road, Ahmedabad) from 13/11/03 (10:00 AM) to 22/11/03 (10:00 AM) for observation. Directors of Sterling Hospital specially Dr. V. N. Shah and the management committee of Sterling Hospital kindly consented to look after the ethical aspects and the funds for the project including various tests.

The strict monitoring to ascertain the genuinity of his claim (Not eating anything, not drinking anything, not passing urine and not passing stool) was done by the unbiased august body i.e. Association of Physicians of Ahmedabad, under precise protocol set by the Secretary of the Association, Dr. Urman Dhruv, along with executive committee of the association.

The research panel of doctors was headed by Dr. Sudhir V. Shah (Consultant Neurophysician, Sterling Hospital/Associate professor of neurology at K. M. School of PGMR, Ahmedabad).

During the project, Dr. Sudhir Shah was in touch with Professor Dr. Selvamurthy frequently who is the over all controller of Defence laboratories including DIPAS (Defence Institute of Physiology and Allied Sciences), New Delhi. He was kind enough to guide the protocol of monitoring as well as further tests for the project.

During the study period Mr. Jani was completely monitored by doctors, staff members and security people all throughout the day.

He was asked to make an affidavit to undergo the study with clear understanding that if his health or medical parameters deteriorate then panel of doctors will withdraw from the study.

He was kept in ICU for 24 hours i.e. 13/11/03 (10:00 AM to 14/11/03 (10:00 AM) and then was kept in a room with glass door .The toilet door was sealed. CCTV camera was set in the room for the rest of the period of study i.e. from 14/11/03 to 22/11/03 (10:00 AM). Medical officers on duty were assigned the job to monitor him. Staff persons were deputed on round the clock duty for 9 days and nights continuously to stay with Mr. Jani in the same room to closely watch him and make sure that he does not eat, drink, pass urine or stool. The video tapes were reviewed for all 24 hours of all these days by committee. Mr. Jani was not allowed to go out of the room except for sonography of bladder and MRI testings, but even during that period, he was all the way accompanied by doctors. He agreed not to take bath or have body sponging for first seven days as decided by the panel.

Clinical opinions of system examination of all experts were obtained including cardiac, renal, neurological, urological, gastrointestinal, general medical, pulmonological, ophthalmic, ENT, psychiatry and others. A series of investigations were done as per protocol defined earlier as well as additional tests were carried out as per suggestions of the team.

Clinically all his systems were generally normal. All his special senses were also ok except moderate hearing loss. However, his pulse remained at 42-46/min, BP about 114/80 mmHg and respiration around 12-14/min. His cognition and behavior was all right.

His weight was taken daily. His clinical examination including vital data and general examination and systemic examination was done daily. Urinary volume in the

bladder was checked by ultrasound twice daily at 10:00 AM & 6:00PM. This showed that there was urine accumulation, which ultimately decreased on its own without passing.

Blood samples were checked regularly with frequent monitoring of CBC, RFT, electrolytes, sugar and acetone. There was mild alteration in renal parameters and there was slight fall in weight, which subsequently stabilized. Otherwise all reports were in normal range. Genetic study report is awaited. The above study was done for the period of 10 days.

Pertinent Clinical Investigations Hematology Blood Group: "A" +ve Date: 12/11/03

page3image5936.png ↵

Hb: 10.8 G% T.RBC:4.17 TC: 4880 /c.mm. DC: 40/47/10/03/00

66/27/04/03/00 PC: 3,52,000 /c.mm.

ESR: After 1 hr: 10 mm Blood Indices: HCT: 35.8 MCV: 85.9

MCH: 25.9 MCHC:30.2

Date: 20/11/03 Hb: 12.9 G% T.RBC:5.17 m/c.mm. TC: 7690 /c.mm. DC: 62/25/04/05/01 PC: 4,86,000 /c.mm. MPV: 9.0fl ESR: After 1 hr: 25 mm

After 2 hr: 52 mm Blood Indices:

HCT: 42.2 MCV: 81.6 MCH: 25.0 MCHC:30.6

14/11/03

11.3 G% 4.37 5780 /c.mm. 47/41/09/03/00

4,25,000 /c.mm.

37.9 86.7 25.9 29.8

16/11/03

11.5 G% 4.49 5640 /c.mm. 52/36/09/03/00

4,53,000 /c.mm.

38.5 85.7 25.6 29.9

18/11/03

12.3 G% 4.87 8180 /c.mm.

5,03,000 /c.mm.

42.0 86.2 25.3 29.3

Biochemistry

Date: 12/11/03 Prolactin: 3.80 S. Cortisol: 12.2 microgm/dL S. Total Proteins: 7.27 Albumin: 4.05 Globulin: 3.22 A/G Ratio: 1.26

Gamma GT: 31.0 U/L Thyroid Function Test: T-3: 0.86 ng/ml T-4: 5.90

TSH: 3.15 microIU/ml Lipid Profile: S. Cholesterol: 216.0 mg/dl S. Triglycerides: 127.6 mg/dl HDL: 57.2 mg/dl Direct LDL: 118.9 mg/dl Cal. LDL: 133.28 mg/dl Very low density lipoprotein: 26 mg/dl LDL/HDL: 2.079 Cholesterol/HDL: 3.776

S. Electrolytes: S. Na+: 139.8 mmol/L S. K+: 4.61 mmol/L S. Cl-: 103.2 mmol/L S. Acid Phosphatase: Total Acid Phosphatase: 4.58 IU/L Non Prostatic ACP: 2.58 IU/L Prostatic Phosphatase: 135.19 IU/L

S. Bilirubin: Total Bilirubin: 0.48 mg/dl Conj: 0.10 mg/dl Unconj: 0.38 mg/dl Delta: 0 mg/dl SGPT: 21.0 U/L SGOT: 22.0 U/L S. Alk. Phosphatase: 95.0 U/L

FBS: 85.7 mg/dl Blood Urea: 33.0 mg/dl S. Creatinine: 1.36 mg/dl

S. Uric acid: 5.26 mg/dl S. Acetone : 10 mg/dl Human Growth Hormone: 0.14 ng/ml

Date: 14/11/03 Blood Urea: 46.9 mg/dl S. Creatinine: 1.53 mg/dl S. Na+: 145.1 mmol/L S. K+: 4.60 mmol/L S. Cl-: 107.0 mmol/L S.Acetone : 10 mg/dl Date: 15/11/03 S. Na+: 143.7 mmol/L S. Acetone: 30.0 mg/dl (Present)

Date: 16/11/03 Blood Urea: 59.6 mg/dl S. Creatinine: 1.52 mg/dl S. Na+: 148.3 mmol/L S. K+: 4.97 mmol/L S. Cl-: 106.8 mmol/L RBS: 84.9 mg/dl S. Acetone: 30.0 mg/dl (Present)

Date: 18/11/03

S. Uric acid: 11.44 mg/dl SGPT: 10.0 U/L S. Acetone: 30.0 mg/dl (Present)
Blood Urea: 63.7 mg/dl S. Creatinine: 1.75 mg/dl S. Na+: 154.3 mmol/L S. K+: 4.37 mmol/L S. Cl-: 107.5 mmol/L

ABG: (Venous Blood) PH: 7.31 PCO2: 48 PO2: 23

TCO2: 25 HCO3: 23 BE: -3.0 O2 sat: 35% Venous RBS: 162.0 mg/dl

Date: 20/11/03

T-3: 0.97 ng/ml

T-4: 9.0 ug/dl TSH: 2.1 ulu/dl Plasma Cortisol: AM: 11.0 ug/dl FBS: 76 mg% Blood Urea: 77 mg% S. Creatinine: 1.7 mg% S. Na+: 155.9 M.Eq/L S. K+: 4.67 M.Eq/L

S. Cl-: 115.9 M.Eq/L SGPT: 24 Units/ml S.Acetone : 30 mg\dl

Date: 21/11/03 Blood Urea: 87.5 mg/dl S. Creatinine: 1.46 mg/dl S. Na+: 143.5 mmol/L S. K+: 4.16 mmol/L S. Cl-: 101.5 mmol/L S. Acetone: 30.0 mg/dl (Present)

Date: 25/11/03 S. K+: 3.40 mmol/L SGPT: 23.0 S. Creatinine: 1.40 mg/dl S. Na+: 137.5 mmol/L Blood Urea: 48.2 mg/dl RBS: 99.8 mg/dl

Audiological Evaluation: (17/11/03)

Bilateral severe to profound degree of sensori-neural hearing loss.

ECG and cardiac evaluation were normal.

Radiological Investigations

X-Ray Chest PA (12/11/03): No significant abnormality detected.

USG Abdomen (12/11/03): No significant abnormality detected.

Doppler examination of carotid, vertebral, abdominal aorta and peripheral arterial system of lower limbs were quite normal.

MR Angiography of Brain, Neck & abdomen was unremarkable. MR Oesophagus: Normal study MR cholanigopancreatography: Normal study MR Abdomen – pelvis: Presence of bowel gas and solid faecal material.

Gall bladder collapsed. Urinary bladder partially filled with urine around 70ml

MR Myelography: Normal study

Cartography (26/11/03): Normal study.

After day 10, the committee is satisfied with following matter:

- 1.The protocol was strictly adhered to.
- 2.Mr. Jani has not passed or dribbled urine during these 10 days.
- 3.He has not taken anything by mouth or by any other routes not even water for 10 days.
- 4.All his parameters remained within the range determined by the committee.
- 5.He has shown evidence of formation of urine, which seems to be reabsorbed from his bladder wall. However at present the committee does not have any scientific explanation for the same but the help of senior scientists and medical personnel of the country is being taken for the same.

We are surprised as to how he has survived despite above particularly without passing urine for 10 days and remaining generally physically fit. However it should be made very clear that we have confirmed the claim over 10 days only and we as scientists and responsible doctors cannot say anything regarding validity of the claim of his sustaining without food, drinks, urination and excretion of stools over several years.

Our attempt is to understand this wonderful phenomenon having confirmed from our side over these 10 days and we are not sure whether this is reproducible in other human beings by the way of YOGA as he practices or by other methods like Genetic Engineering. If so, also we are not sure whether and how it can contribute to human welfare. At the moment, we are trying to analyse the results and trying to learn for the betterment of science. Probably, some invasive investigations may help understand this process but from the beginning Mr. Jani has refused any invasive procedure or any sort of injections be it a dye only.

Dr. Urman Dhruv (Physician & Secretary of APA)

Dr. S. V. Shah (Consultant Neurology & Head of Research Committee)

Dr. V. N. Shah (Diabetologist), Director-Sterling Hospital

