

## 2. Enigma of The Truth

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### **Abstract**

What is the Truth of our existence and do humans have the capability of knowing it? These are the two questions which science, philosophy and religions have been trying to answer since ages without much success and, in the process, produced many hypotheses. Jainism too has pondered over these questions. We discuss these aspects in this article and compare them with the modern scientific concepts.

In the present context by 'Truth' we mean the origin of Universe, origin of life, their ultimate fate and the laws governing the living and the non-living. The origin and nature of 'self' and consciousness, the question of life after death (rebirth) etc. constitute important aspects of life. Scientifically, the origin of the Universe and the laws governing the material Universe have been studied based on various laws and principles of physics, specifically General Theory of Relativity, Quantum physics, and more recently Quantum Gravity has been invoked, but the questions

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related to consciousness have remained elusive. There is a dilemma whether every event in the life of a being is predetermined or is governed by the law of Karma. These questions can be discussed within the framework of some Jain doctrines viz. *Anekāntavāda* (multiplicity of modes), *Syādvāda* (uncertainty), *Nayavāda* (contextuality) and *Saptabhaṅgī*; *Saptabhaṅgī* describes the possibility of seven modes of existence and arises from combinations of *Anekāntavāda* and limitations of sensory knowledge and mental deductions. In this article, it is emphasized that only some aspects of an object can be known at any time and the only true and definitive statement one can make about an object (living or non-living) is that nothing can be described completely and with certainty, which would hold true at all times, in all contexts and is termed as *Ajñeyavāda* which defines limitation of all knowledge.

The concepts of *Syādvāda* and *Anekāntavāda* have profound scientific implications, specifically in the context of quantum mechanics, wave-particle duality, complementarity, logic, probability and statistics. We first discuss these Jain doctrines in relation to some concepts of modern physics (Uncertainty principle and wave-particle duality). Heisenberg's Uncertainty principle, non-locality of wave nature of particles and Gödel's Incompleteness theorems put severe constraints on the accurate and complete description of certain phenomena. As we approach the point of origin of the Universe (or consciousness?), we encounter some degree of uncertainty, both according to current scientific theories and the ancient Jain principles and it appears that it may not be possible to know their origins with certainty.

Even so, Jainism claims that humans can realize the truth, not by sensory organs, mind or scientific observations, but by direct experience through consciousness (by the Omniscient), without the mediation of sensory organs. Truth can only be experienced, it cannot be described completely.

Before we address the question of the origins and compare the Jain concepts with scientific understanding, it is desirable to see if indeed there is any scientific basis for such a comparison i.e. are the Jain philosophic concepts, enunciated many millennia ago, scientific enough to be debated in modern context. This depends on both, the content and approach of Jainism. The question has been discussed in a separate paper (Bhandari, 1917) in which it has been concluded that there exists a mention of a few

principles, laws and facts in the Jain *Āgamas*, documented millennia ago, which have been discovered by scientific techniques as recently as during the last one or two centuries. These are listed in Appendix-1. No doubt there are some serious disagreements between some Jain findings and scientific observations (listed in Appendix-2), but the information given in Appendix-1 justifies the scientific basis and logic on which the edifice of Jain philosophy has been constructed.

### 1. Defining the Problem

The Truth or the enigma of our existence, involves several questions for which accurate, verifiable or universally acceptable answers have been difficult to obtain. These questions are related to the origins, existence and future of the Universe in which we live, and of our being, sometimes referred to as self or soul. How the Universe originated and how it will end; Is the Universe real, eternal or only *Māyā* (illusion), a product of Quantum Vacuum or it is just a holographic, virtual world. How the self came into existence and what happens to it after the body dies. Is there an eternal soul (*Ātmā*) or it is just a myth or a hypothesis? Is there a Brahman, universal soul (*Paramātmā*) or God the creator? Is there a universal or individual, personal purpose of life and if so what is it? What is consciousness? Does it have an independent existence or it just appears when the neural network in the brain develops a critical level of complexity. There are also many other questions related to consciousness e.g. how the information is integrated in the brain and how it is converted into experience (Qualia). Answers to these questions are believed to be related to the 'Ultimate Truth' of our existence.

The Truth, in essence, involves three factors: The object (or the subject) to be known (in this case the Universe and all its components, including the self), the knower (sometimes called the *Ātmā*, *cetanā* or consciousness) and the knowledge (scientific, logical and intuitional). Of all the living beings, humans have the most developed brain but even their faculty of observation and comprehension has severe limitations, depending on the state of development of sensory organs and brain (and mind), which can understand a thing only within a limited perspective. It should be realized that humans are not the ultimate, perfect, final products of nature and much scope remains in store in the future for further evolution, progress and perfection. The nature is multifaceted implying

that everything in the Universe, living and non-living, have an infinite number of modes which, though potentially coexist in it all the time, are latent and only manifest under different conditions at different times. Furthermore, contrary to the scientific view, which classifies knowledge into two parts, Known and Unknown, Jainism postulates that there are three categories of knowledge: Known, Unknown and Unknowable by sensory organs. Whereas 'unknown' can be converted into 'known' by study of an object, unknowable can never be known by sensory organs or mental deductions. Combinations of these three aspects, i.e. nature of the Universe, which is changing every moment, limitations and imperfections of senses and mind, and unknowability (*Avaktavya*: Indeterminable or indescribable) of the objects, make it difficult to define anything perfectly, correctly and completely, in all its aspects.

The above questions have been debated by various philosophies, religions and science ever since the humans appeared on the Earth and form the core questions in *Vedas*, *Sāṅkhya*, *Mīmāṃsā*, *Upaniṣads*, Buddhism, Jainism, Hinduism, Christianity, Islam and Judaism, essentially in all the philosophies of the world. Each religion has discussed these questions with all seriousness and proposed models which can be broadly classified as Biocentrism and Materialism, each being a form of *Advaitavāda* (Monism) and *Dvaitavāda* (Duality), which includes both. Jainism is different from these concepts, basically subscribing to *Dvaitavāda* of *Jīva* and *Ajīva*, but further goes on to propound that the *Ajīva* consists of five, independent, eternal *dravyas* (*Ākāśa*, *Pudgala*, *Kāla*, *Dharmāstikāya* and *Adharmāstikāya*); thus the Universe (*Loka*) is made up of six *dravyas* in all (Hexa-D model; Bhandari, 2017). The various models can be briefly described as follows:

**(a) Materialistic View:** Matter (elementary particles) formed first, as in Big Bang creation of the Universe and as the Universe cooled and aggregated to form various structures, simple life forms (algae) appeared by abiotic synthesis of long chain carbon compounds (proteins, nucleotides, amino acids, sugars etc.). As complex species evolved further by Darwinian evolution to form brain, i.e. neural network, mind and consciousness arose spontaneously and suddenly.

**(b) Biocentric or Vedāntic View (*Advaitavāda*: Monism):** Consciousness (*Brahmn*) is the only motive force, existed first (there is none other which is existent, i.e. there is no second) and is eternal and

independent. Consciousness is energy and energy (E) can be converted into matter (mass, M) and vice versa according to the Einstein's relation  $E=Mc^2$ , c being the velocity of light. This led to formation of matter. This argument can also be used to support the reverse process i.e. life formed out of matter as in (a) above. Essentially, there is only one eternal element that is omnipotent *Brahmn*. Everything we see around (matter, energy, space, time, motion, rest etc.) miraculously and spontaneously arose from it.

**(C) Dvaitavāda (Duality):** Life comes from life. It is an everyday observation that life arises only from living beings and cannot be created from non-living entities like matter [*omni vivum ex vivo*]. Thus the two, life and matter are independent and one cannot be produced from the other. These are sometimes termed as *Puruṣa* and *Prakṛti*: Consciousness (*Puruṣa*) and Matter (*Māyā* or *Prakṛti*) are eternal or they arose at the same time, independently and simultaneously. It is *causa sui*, cause of itself. The whole Universe is the interplay of the two: *puruṣa* and *prakṛti*.

**(D) Jain View:** *Pudgala* (*paramāṇu*) and *Ātmā* are eternal and ever existent: *Paramāṇus* aggregated and gave rise to the material Universe and *Ātmā* combines with matter (*karmāṇu*) and gives rise to different living species. In a way, consisting of *jīva* and *ajīva*, this view is a kind of '*Dvaitavāda*' but differs in essential details, as these two are not the only *dravyas* but there are additional four eternal *dravyas*, which facilitate soul-matter interactions (Bhandari, 2017), making them six altogether (Hexa-D model) constituting the *Lokākāśa* (Universe).

Answers to any or all of the questions, posed above, reveal different aspects of the Truth of our existence. After pondering over these questions at depth, some philosophies came to the conclusion that the cause of origins cannot be determined with certainty or precision as is very aptly stated in the *Nāsadīya Sūkta* (*Rgveda* ~3000 BCE). As a last resort, the almighty God, with miraculous powers for creating the Universe was invoked. Jainism and Buddhism do not subscribe to this concept and have given logical models invoking soul or mind as the ultimate source of sentience. Other oriental as well as western philosophies have also given considerable thought to these questions and provided several powerful concepts, but none can be established because their proofs lie in experience and is beyond logic. Scientific studies involving new tools of observations, modeling and theoretical basis have provided dependable,

testable, reproducible and compelling evidence of various processes operating in the Universe, but science itself is an extension of sensory organs and inherits the same limitations of imperfection. The question of origins thus remains beyond the grasp of sciences. The ancient wisdom of *Vedānta*, Jain and Buddhist thoughts still provide some appealing options.

There is also the question of whether the humans have the capability to know the truth. Other animals, we know, cannot even ask this question, let alone understand it. There is nothing special about humans and it is only one link in the long chain of evolving species which will continue in the future. May be some future species, which evolve to a higher state of mind or consciousness compared to humans will develop this capability.

In this article we compare some of the underlying Jain concepts with some modern scientific principles, specifically regarding the origin of the Universe, origin of self and the laws governing the Universe and see whether they can be reconciled with each other.

## 2. Scientific Concepts

In a previous study (Bhandari, 2015), I was able to establish that there are some principles which are similar in Jain philosophy and modern science, even though there are many areas where severe inconsistencies persist. In fact these Jain principles were propounded much before they were discovered by scientific observations and theories. These are listed in Table 1 and some points are elaborated in Appendix-1.

**Table 1: Some basic principles common to Science and Jainism**

Science (physical world)	Jainism (living and non-living)
Causality	<i>Karmavāda</i>
Determinism	<i>Kramabaddhaparyāya</i>
Entanglement	<i>Parasparopagraho Jīvānām</i> Interdependence of all life
Laws of conservation	Eternal nature of all <i>Dravyas</i>

It may be noted that the scientific principles or laws are applicable to physical, material world whereas Jainism has a much wider scope, and

includes both the living and the non-living. This table establishes the scientific credentials of Jainism and encourages us to pursue the Jain concepts scientifically.

### 2.1 Origin of the Universe

There are many theories of the origin of the Universe. It is clear from consideration of various principles of physics that a static Universe is unstable. The Big Bang theory is the most successful, supported by observations of receding galaxies, microwave background and many other features. Alternative models such as the Steady State Universe (Narlikar, 2002), which is closer to the Jain and Hindu Universe, have not found observational support or physical evidence though it may be conceptually appealing. Cyclic Universe, which may accommodate the expanding Big Bang Universe as one of the cycles, is another possibility (Penrose, 2006). Another model proposes the origin of the Universe from Quantum Vacuum (QV), akin to *Sūnayatā* (nothingness) of Buddhism, which may act as the substrate from which the Universe arose (see Abraham and Roy, 2010).

### 2.2 Heisenberg's Uncertainty Principle

In the QV model, there are energy fluctuations in vacuum and virtual particles can materialize from these fluctuations, some of which get isolated, leading, ultimately to the formation of the Universe. On the other hand, there is overwhelming evidence, observational as well as theoretical, for the Big Bang event, 13.7 billion years ago, when all there was, was energy, which exploded and matter, time (t) and space were created. This model is not so aesthetically pleasing because there is lot of *ad hocism* in the state at  $t=0$ , which is considered to be a singularity, and the physics does not allow us to extrapolate back in time to  $t=0$  or  $t<0$ , i.e. smaller than Planck time ( $= \sqrt{\{hG/(2\pi c^5)\}} = 10^{-43}$  seconds)<sup>2</sup> or to space dimensions smaller than Planck length ( $=\sqrt{\{hG/(2\pi c^3)\}} = 10^{-35}$  meters). Below these levels, Uncertainty takes over and the deterministic laws of physics are not valid. In this model, the question as to what was there before the Big Bang event does not arise, because time itself was created

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2. Here  $h$  = Planck constant;  $c$  = velocity of light,  $G$  = Gravitational constant.

then. Thus we see that the laws of physics do not allow us to understand the state of the Universe at  $t=0$ , so we can never understand the origin of the Universe with precision.

In this article we consider four glaring constraints or limitations of modern science, which do not allow us to come face to face with Reality (origin of the Universe). Besides, the Heisenberg's principle of Uncertainty, which does not allow us to extrapolate to  $t \leq 0$  as discussed above, there are constraints imposed by the Special theory of Relativity and the Schrödinger's description of wave nature of matter. The argument based on Gödel's Incompleteness theorems will be discussed later.

### 2.3 The Schrödinger's Wave Equation

The Schrödinger's Wave Equation describes the nature of matter from minute particles to large structures i.e. the Universe and is central to Quantum physics. It can be mathematically expressed in terms of the wave function  $\psi$ :

$$\psi = a \psi_1 + b \psi_2$$

This describes the existence of matter in form of a wave, with many possible states of existence. The general impression is that mathematical formulation leads to precision but, in effect, any formulation describes only one aspect precisely but leads to loss of information on other aspects, because the indescribable, unmanifested, aspects cannot be formulated and the moment we express it in mathematical form, the other possibilities cease to exist. This implies that we do not know what an electron really is: a particle or a wave or something else (a wavicle?) which sometimes manifests as particle and at other times as waves. When electron is observed by a particle detector, it materializes and the other aspect (wave nature), which was coexisting with it before it was observed, is lost forever. It also happens the other way round, i.e. when it is observed as a wave. Thus observation also leads to loss of information and completeness. Thus the true and complete nature of a substance can never be formulated; only one of its aspects can be.

### 2.4 Special Theory of Relativity

There is yet another limitation of science and that arises from the

Special Theory of Relativity (STR). The fundamental postulate of STR is that nothing, at least no information or matter, can physically travel with velocity greater than light ( $c \sim 3 \times 10^8$  meters per second), so that we can see only a limited part of the Universe, defined by the product of the velocity of light and the age of the Universe (13.7 billion years). That is as far as we can see i.e. from where the light can come to us over the age of the Universe. This calculates to a sphere with a radius of  $10^{23}$  km and we can never tell what lies beyond this space. What lies beyond can only be conjectured by some hypothetical models.

### 2.5 Gödel's Incompleteness Theorems

As mentioned above, while considering Schrodinger's wave mechanical formulation, we generally have the impression that mathematical representation, e.g. formulae describing various scientific facts makes our knowledge more precise and accurate. This may be true, but precision and accuracy is obtained at the cost of completeness. Formulation of any observation makes knowledge incomplete as its aspects which cannot be formulated are lost. Kurt Gödel (1931) has shown 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, unmanifested field of intelligence. Gödel's two incompleteness theorems put such constraints on complete knowledge and can be stated as follows:

1. The first Incompleteness theorem states that "If the system is consistent, it cannot be complete, and the truth of a formalism (which describes any phenomenon) cannot be proved".
2. The second Incompleteness theorem states that "The consistency of the axioms cannot be proven within the system, i.e. the definition of truth for a theory must be of a higher order than the theory itself".

Thus we come to the conclusion that at least four core principles of modern physics, listed above, limit our knowledge and do not allow us to determine the origin of the Universe with precision or completeness. Several other arguments can also be developed e.g. our model of the Universe is based on the visible matter (stars, galaxies, dust and planets etc.) which is only about 4% of the constituents of the Universe. We know

little about the invisible or Dark matter, which cannot be seen but whose existence is established by its gravitational pull and constitutes 5 times as much (21%). The Weakly Interacting Massive Particles (WIMP etc.) proposed for this gravitational effect have not yet been discovered, in spite of serious experimental efforts for the past 30 years. Neither there is much knowledge about the dark energy, which produced a huge repulsive force and expanded the Universe in the beginning, soon after Big Bang, called inflation of the Universe. This is estimated to be the overwhelming constituent (75%) of the Universe, some 19 times more than the visible matter. In the absence of complete knowledge of all the constituents of the Universe, it is futile to model its origin and evolution.

Moreover, humans are not the 'know all' species. Homosapiens are only a link in the evolutionary chain of species and in future more knowledgeable species may develop, which may have less limitations of sensory organs compared to humans. This puts additional constraint on our modern day knowledge. Whether in future species with perfect sensory organs will evolve remains a big question, but, in any case, Jainism does not consider sensory perception as reliable and advocates supersensory perception to be perfect. Now we discuss this problem of origin of the Universe from the Jain perspective.

### 3. Jain Constraints on Knowledge

Jainism is a non-absolutist philosophy and to illustrate the limitations of knowledge, we consider its four aspects here: *Anekāntavāda* (Multiplicity of modes); *Syādvāda* implying that no proposition is complete or fully correct; *Nayavāda*: stand point or contextuality; and *Saptabhaṅgī*: seven modes of predication, which includes indescribability, and limit our perception of the reality.

#### 3.1. *Anekāntavāda*

*Anekāntavāda* describes the true nature of reality. Everything in nature, living and non-living has infinite modes (*pariyāya*) of existence. It is variously defined as Multi-foldedness, Multi-facetedness, Non-Absolutism, Relativism, Multi-Perspective view, Perspectivism, Pluralism, co-existentialism and in physics it is called complementarity. Everything (living and non-living) in the Universe is made of two or more components. When an object is an aggregate (*skandha*), all the properties

of the constituents coexist in the material entity and the aggregate behaves in different ways, under different conditions.

### 3.1.1 Multiplicity of Manifestations

We see that as one goes to finer and finer constituents of matter (from gross objects, i.e. large celestial structures, to molecules to atoms to protons to quarks and so on), it exhibits more and more attributes, like electric charge, spin, magnetic properties etc. It is difficult to perceive all of these subtle properties at once in the gross substance, although they inherently exist all the time. This is not a limitation of instruments or techniques of measurement, nor it is a limitation of consciousness with which we perceive these properties, but it is due to the innate nature of things. At any instant, we can only know the modes (*paryāya*) which exist now. In view of *Anekāntavāda*, at the present instant, we cannot know its modes which existed in the past or those which will be manifested in the future. Thus our knowledge will remain incomplete.

### 3.2 *Syādvāda* : Principle of Contextual Uncertainty

Every statement is only partly true and none is completely true. To emphasise this underlying principle, Mahāvīra introduced *Syādvāda* when he urged his disciples thus: "since you have taken a vow to always tell the truth, you must qualify every statement by *syāt*, because otherwise it will be falsehood". Thus the only statement one can make with certainty is that "*No proposition can be made with certainty*". It does not mean ambiguity, confusion or doubt but makes our understanding as correct and complete as it can be, because this is how the nature is. *Syādvāda* can thus be termed as the Jain principle of Uncertainty<sup>2</sup> and it implies that:

- No proposition is absolute or complete truth, or there is NO ONE Truth.
- No proposition is complete because deeper one goes, more properties are revealed. Nature exists at multiple layers and some part of truth (property) always remains hidden or undescrivable (*avyaktavya*).

### 3.3 Perspectivism

Perspectivism, at any point of time, or under a given condition, is

essentially a consequence of *Nayavāda* or mental frame of mind. It can best be illustrated by the parable of the six blind men and an elephant, in which each blind man feels different parts of the elephant's body i.e. its leg, tail, trunk, tusk, belly, and ear and describes it, based on their individual experience, as a pillar, rope, branch of a tree, solid pipe, wall and a hand held fan respectively. Each one of them is partly correct but all are far from the complete truth. A practical consequence of perspectivism is that everything has seven modes of existence, termed as *saptabhaṅgī*.

### 3.4 *Saptabhaṅgī*

Every “thing” can have seven states of existence or manifestation: It is, it is not; it is both, it is and also it is not; it is neither; it is and is indescribable, it is not and is indescribable; it is both and is indescribable. This can be illustrated by any elementary particle such as an electron which exhibits wave-particle duality.

- In some respect, Electron is a wave.
- In some respect, Electron is not a wave (but a particle).
- In some respect, Electron is both a wave and a particle.
- In some respect, Electron is neither and is indeterminate.
- In some respect, Electron is a wave and is indeterminate.
- In some respect, Electron is not a wave and is indeterminate.
- In some respect, Electron is both, a wave and a particle and is indeterminate.

The legend has it that Mahāvīra, after He attained enlightenment, saw in his dream a strange bird having seven types of feathers representing the true nature of reality. Such birds do not occur in nature but this is how the nature is.

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<sup>2</sup>This principle is quite different from the Heisenberg's Principle of Uncertainty in quantum physics, which states that both the conjugate parameters like Energy and Time or Position and Momentum of a particle cannot be simultaneously determined with absolute precision, and the uncertainty in their measurement is determined by the Planck constant.

Thus we see that the four fundamental Jain concepts (described above) do not allow us to know the truth completely or correctly and put severe constraints on knowledge. Thus science and Jainism, both, do not allow us to know the whole or complete truth with precision. We end up with the conclusion that there is no light at the end of the dark tunnel of uncertainty, either based on our scientific understanding of the laws of physics or observations using powerful instruments or the basic tenets of Jain philosophy. The famous *Nāsadīya Sūkta* (Ṛgveda ~3000 BCE)<sup>3</sup> reflects this uncertainty very eloquently.

Yet, there is a ray of hope, according to Jainism: the soul, in pure state, becomes omniscient and can see, know and experience everything completely, not by using sense organs but in supersensuous way. Just as it happens in dreams, the eyes are closed but we can see. Similarly in a pure state, the soul can see things without using eyes, hear every sound without ears, taste everything without tongue, smell everything without nose, feel everything without touch and know everything without mind. In Jainism, self or *ātmanā* is identified by its two perennial activities: *Jñāna* and *cetanā* (consciousness). Therefore, we now look into the concepts associated with the soul, both scientifically and according to Jain philosophy.

### 4 Consciousness

We are all conscious, and we know we are conscious, but it has been difficult to define consciousness. Consciousness is generally considered as awareness (of external world and self) and experience. 'I know that I exist' and 'I know that I experience' is the result of this property or power of the self. It integrates information, experiences from observations, makes choice of action and thought, results in emotions and feelings and has the capacity to control them.

Modern scientific theories presuppose that consciousness originates from matter. Brain is made up of neurons, synapses, axons etc.

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<sup>3</sup>The *Nāsadīya Sūkta* ponders over the fundamental question “What was there in the beginning, before water, air, light and Earth, Universe and God came into existence?” and goes on to describe the primeval conditions “There was neither non-existence nor existence then; no death, no immortality; no day, no night; no above, no below etc.”; “Who really knows?”, it asks. “Perhaps it created itself, perhaps it did not. Maybe it was the *Hiraṇyagarbha*, the primal nucleus. Perhaps He who looks from the highest heavens knows or even he knows not” it says.

all of which are made up of matter. When the neural network attains a certain complexity, mind emerges spontaneously. Huxley likened mind to Aladdin's lamp which when rubbed, a Genie appears by itself. Penrose (1994) has proposed a quantum gravity model of consciousness involving nanometer sized microtubules inside brain neurons. According to Hameroff (2007) and Hameroff and Penrose (2014) consciousness is the result of a series of quantum computations in microtubules, orchestrated (Orch) by neuronal/synaptic inputs, leading to objective reduction (OR). Thus Orch OR is a conscious event, what we prefer to call, from Jain point of view, as conscious decision making process. In Jain view, conscious decision making is not consciousness but only a process. Whereas consciousness is an ever existing (*sat*), eternal activity of the soul, it is the doer, who takes decisions and acts. Consciousness uses brain as a tool and is not produced by it. Consciousness is all the same, perfect, complete and full, in all living beings, but is inhibited to different extents in different species by the capacity of their brains, mind and sense organs.

Although many aspects of brain functions have been understood by direct observation of different parts of the brain, there are serious problems, specifically of how awareness and experience are created from simple sensory observations. These two problems, related to Qualia, have been classified as the 'Hard problem' (conversion of observation into experience) and the 'Binding problem' (synthesis of different types of signals obtained by sensory observations into one integrated whole) and memory, as will be discussed later. Here the 'whole' (experience) is more than the sum of the observations (sensory inputs). This has been amply illustrated by excitement parameters of brain function. Consciousness acts through neural correlates. Observations of brain activity show that the ensuing action after impingement on our sense organs, for example, verbal reply to a questions or return of a tennis ball after the ball has been played by the opponent, is completed within about 100 milliseconds, whereas, neural correlates of conscious perception apparently occur ~150 to 500 milliseconds after the impingement on our sense organs. Therefore the brain reacts 50 milliseconds or more *before* all the information becomes available to it. Therefore it is hard to believe that there is causal connection between conscious perceptions and the ensuing action. The observation from different organs, i.e. visual, olfactory, auditory etc. are received by the brain through different organs, but their integrated or synthesized whole is 'experienced' by the brain, much before the time required for

them to be analyzed and synthesized. Therefore, one of the more serious problems is the temporal precedence ( $\sim 2$  milliseconds) of formation of the correlates of consciousness or what we can say the response or experience occurs *before* the occurrence of the event. This can be termed as anticipation and it is known to improve with practice. In extreme case it can be considered as clairvoyance or premonition. This means that the soul can anticipate the action on receipt of part of the information; reception of the total information is just a formality, it is extrapolated from the first part received.

### 4.1. Jain Concept of Consciousness

In many philosophies, especially in Jainism, consciousness is considered to be the attribute of *Ātmā* (Soul). Therefore consciousness is central to our discussion of Truth. In the Jain model *Ātmā* has permanent existence, is eternal, and is a basic, independent *dravya* or verity; It is the one who knows, who perceives and who acts. Various powers of *Ātmā* have been described in *Samayasāra* and have been briefly summarized in my book (Bhandari, 2015). It knows the past, present and future of all objects, their all *paryāyas*, all processes in the Universe, at once, within one *samaya* (the smallest interval of time, thought to be much, much smaller than Planck time). Essentially *Ātmā* is omniscient. *Jīva* (the living being) does undergo the processes of origination, sustenance with change, and destruction while the *ātmā* (or consciousness) continues as essence of existence through all these processes. The most important aspect of consciousness is that in pure state, it has the capacity to know everything, without sensory organs. Thus consciousness of all species is perfect, identical and omniscient (*Kevalajñānī*). In such a state, the object, the knower and the knowledge merge into each other and the person becomes "only knower" (*Kevalajñānī*). In practice, it is limited by the capacity of the 'brains' of various species and thus it appears at a different level or manifests to different degrees in different species.

Jainism prescribes certain procedures, mainly based on non-violence, self discipline and penance, for cleansing the self for removing these limitations so that the consciousness manifests fully. Study of the brain functions and transmission or control of emotional feelings through molecular-chemical or neural-electrical pathways support some of these Jainistic ideas.

## 4.2 Jain Model of Consciousness

The Jain model of consciousness, with its inherent power of omniscience, offers a ray of hope in learning about the ultimate Truth. It explains Qualia, precedence of reaction compared to perception (20 to 50 Millisecond; Libet, 2004), temporal Binding problem, anticipation, clairvoyance, telepathy etc. Briefly, according to many oriental philosophies, the mechanism by which everything in the Universe gets known (omniscience), is through *Bodhi* or consciousness field which pervades the whole Universe (See Abraham and Roy, 2010). All species are instantaneously connected and are in communication with each other through this field. That is, every soul (embodied or free) and therefore every living being is connected to it. The strength of this bond depends on the degree of purity of the soul. *Karmas* (and passions) tend to dampen this bond. The laws operating in this field are different from the laws of the physical Universe (e.g. STR, where only speeds below the velocity of light are permitted) and involve instantaneous connectivity throughout the Universe, instantaneous communication, instantaneous movement of the souls etc. This model can make clairvoyance, telepathy, omniscience, transmigration and many qualities of the soul, feasible. How does it happen? Some clues are available in Jain scriptures. Some more assumptions can be added to them in order to enable us to understand the dynamics of these phenomena and a working model can be constructed.

There is one important consequence of this assumption. Causality i.e. cause and effect relationship is not instantaneous. For the Law of Causality to operate, past, present and future, all the three, have to be involved. Causality collapses and cannot operate within one '*samaya*' which defines the present moment. One must therefore visualize the whole Universe within one *samaya* to be able to understand all the processes. One who can do it can be called the 'Universal Observer'. Of course, the model remains to be established, which can only be done by individuals who have directly (supersensuously) experienced the Universe. According to Jainism, purity of the soul, *cetanā*, *jñāna* and *karma* are all interdependent. As *karmas* dissolve, *ātmā* gets purified and *cetanā* and *jñāna* spontaneously improve. This model is quite unique to Jainism and, if substantiated, can be developed further.

Based on the above discussion we come to the conclusion that with

**Table 2: Comparison of Some Aspects of Scientific and Jain Concepts of Consciousness**

Materialistic (scientific) view	Jain view
<p>Consciousness is an emergent property of the brain, produced by neural network when it attains a certain level of complexity. It arises during information processing.</p>	<p>Consciousness (<i>cetanā</i>) is an eternal, continuous activity of the soul. Consciousness cannot exist without the soul and the soul never remains without this activity (<i>upayoga</i>). It is therefore considered synonymous with the soul. Since soul is self luminous, all knowing entity, so is <i>Chaitanya</i>.</p>
<p>Consciousness manifests to various degrees depending on the complexity of the neural network of the brain. This is the reason why it is different in different living beings, animals and humans.</p>	<p><i>Cetanā</i> is always 'perfect', full (100%) and complete, never partial; It uses brain as a tool and appear to manifest to different degrees in different species, depending on the capacity of the brain.</p>
<p>Consciousness is considered equivalent to conscious decision making. It is thus a process and not a quality.</p>	<p>Consciousness or <i>Cetanā</i> makes choices or decisions based on its power of Free Will. Thus <i>Chaitanya</i> is an entity, a quality of the soul and not a process.</p>
<p>In the brain decision is made by quantum mechanical superposition. In Orch OR model of Hameroff and Penrose, Quantum processes in inter-dendritic cytoskeletal, nanometer size microtubules act as substrates of consciousness. The decisions are made based on available information.</p>	<p>Soul, through consciousness, can 'see' without eyes, know without mind, hear without ears etc....., i.e. through supersensuous powers and therefore does not need mind or brain or sense organs to know anything or everything.</p>

sense organs and scientific techniques, it is not possible to know with precision how the self (*Ātmā*) or the Universe originated and what will happen in future. As we approach the initial epochs (zero time and point space) of their origins, we encounter an era of uncertainty. Quantum mechanics and Jainism, both propound that there will always be an uncertainty associated with the origin of the Universe. The Truth is thus a paradox in the sense that "One knows the Truth when one realizes that it cannot be known". According to Jainism, soul is pure consciousness and in pure state it can see everything supersensuously and becomes omniscient. Jainism gives procedures for purification of soul through non-violence, self discipline and penance.

#### 4. Summary

From the stand point of science, as we know up to now, and Jain philosophy, we come to the stark conclusion that the Truth can never be understood completely because of inherent limitations of both these methodologies. This is the overpowering consequence of the principle of Uncertainty, non locality, finiteness of the velocity of light, and Gödel's Incompleteness theorems on the one end, and *Syādvāda*, *Anekāntavāda*, *Nayavāda*, *Ajñeyavāda*, i.e. indescribable nature of things, and imperfection of the sensory organs and mind, according to Jainism, on the other.

Science does not offer a clue but Jainism suggests that the consciousness is inherently all-knowing and omniscient can encompass the whole Universe, like the Einstein's Universal observer. All we need to do to know the Truth is to purify the consciousness (self) and observe the Universe *directly* without the sense organs and we will see the seven modes of its existence, all at once.

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## Appendix -1

Some scientific concepts documented in *Āgamas*, rediscovered by scientific studies recently:

### 1. Life in Plants

The western civilization and scientists did not believe that plants have life. Influenced by thinkers like Des Carte, the western thought did not even consider that the lower animals, below humans, have soul or are

living. *Āgamas* clearly emphasize that plants are living entities, have feelings and emotions and this forms a core component of Jain ethos and life style. The fact that plants have life and emotions was experimentally demonstrated by a set of experiments by J.C. Bose and published in his book 'Mechanism of plants' only in 1926, after which it became scientifically accepted.

## 2. Micro-organisms in Water, Air and Soil

Jainism postulated existence of microorganism, invisible to the eye, in earth, water, fire, air and soil, more than 2600 years ago. Scientific proof of such microorganisms came only after Zachharia Janssen and his father in 1590 CE invented a microscope with which microorganisms could be seen.

## 3. Concept of Unit Space and Unit Time

According to Jainism, space and time are quantized. Jainism mentions a *pradeśa* which is the smallest unit of space. This concept of quantum of space can be compared with Planck's length ( $\sqrt{(hG/2\pi c^3)}$  where G is the Gravitational constant, h is the Planck's constant and c is the velocity of light). It is calculated to be  $10^{-35}$  meters wherein, due to the Heisenberg's Uncertainty Principle, laws of physics are not valid. Similarly there is a mention of *samaya*, smallest unit of time in Jain philosophy and some scholars talk about *kālāṇu*, a quantum of time, which can be compared with Planck time ( $\sqrt{(hG/2\pi c^5)}$ ) which is calculated to be  $10^{-43}$  seconds.

## 4. Dimensionless *Paramāṇu* and its Motion

Jainism propounds that *paramāṇu* is the smallest material entity. It is dimensionless and indivisible, and although it undergoes several types of transformations, motion and vibrations, its behaviour is uncertain, depending on some conditions.

The *Bhagavatī Sūtra*, compiled during the early part of the current era, vividly describes types of motions of a *paramāṇu*. "Under certain conditions a *paramāṇu* undergoes simple vibrations, complex vibrations,

motion, oscillations, collisions, penetration and excitation, that is, it undergoes varied transformations; under other conditions, it does not undergo simple vibrations, complex vibrations, motions, oscillations, collisions, penetration and excitation, that is, it does not undergo varied transformations."

Although particles equivalent to *paramāṇu* described in Jain *Āgamas* have not yet been discovered, scientific understanding of such motions of elementary particles came only during the past century. Experimentally, after the high powered electron microscopes were invented, and theoretically, after quantum mechanics was developed during the last century, atoms and molecules have been found to have various types of vibrations, motions, oscillations, penetrations, collisions and excitation etc.

Furthermore, it has been mentioned in the *Bhagavatī Sūtra* that one to infinite *paramāṇus* can coexist in a unit space. This is similar to the Bose statistics, discovered by Satyendra Nath Bose, in 1924, who developed statistics dealing with particles, which are indistinguishable, but can coexist in the same space. These particles are called bosons with spin 1 (e.g. photons) and follow Bose-Einstein statistics.

### 5. Wave-Particle Duality

The soul moves like a wave and also like a particle. This concept of Wave-Particle duality is clearly stated by Ācārya Abhayadevsūri (ca.1015 CE), while quoting *Bhagavatī Sūtra* (6/122) in connection with *samudghāta* (expansion) of the soul at the time of death. There are two types *samudghāta*: *Deśa Māraṇānantika* and *Sarva Māraṇāntika*. In *Deśa Māraṇāntika Samudghāta* the soul, without taking all its *atmapradeshas* with it, expands to its destination of rebirth in the new realm elsewhere in the universe. The soul then returns to the dying body; not all the *atma pradeshas* of the soul had gone to the destination and some had remained within the dying body. This is called *Deśa Samudghāta* (spatial expansion) and the motion of the soul is described as *Illikā* (wave-like) *gati*. Then, upon death, the soul collects all its *ātma-pradeshas* in a ball like form and again goes to the destination like a *genda/genduka* (ball), when the new *jīva* is reborn. This is called *Sarvatmana-utpad-kshetra samudghat*.

## 5. Shells around Celestial Bodies

Mention of *Valaya* or shells around planetary bodies is mentioned in *Bhagavatī Sūtra*. In contrast, scientific discoveries of shells (e.g. Magnetosphere, Ionosphere, and Atmosphere around the Earth) and other planets were made in 1950's after the advent of space age when satellites were sent in space around Earth and other planets.

## 7. Climatic Cycles of 21000 Years and 41000 Years

*Kāla-cakra* or Cosmic wheel of time, described in Jain *Āgamas* clearly mentions six *Ārās* (eras) in *Avasarpiṇī* and *Utsarpiṇī* half cycles, the last of which (VI *Ārā*) has a period of 21000 years. Dr R.M. Jain (2011), N. Bhandari (2011) and Jain, Bhandari and Surana (2017) have argued that these are actually climatic cycles of Earth due to changes in tilt angle, ellipticity and eccentricity of Earth's orbit, as proposed by Milankovitch, known as Milankovitch cycles, and confirmed experimentally as temperature or climatic cycles preserved as oxygen isotopic ratios in the deep sea sediments and Antarctic ice cores. The quantitative agreement of the 21000 year cycle mentioned in *Āgamas* and determined by measuring oxygen isotopic composition is amazing.

## 8. Black Holes: *Kṛṣṇarājī* and *Tamaskāya*

*Sthanang Sūtra* mentions *Kṛṣṇarājī* (Black Giants) and *Tamaskāya* (Dark bodies), which some scholars have translated as Black holes, which are massive invisible stars, discovered astronomically during the past century. They are so massive that space curves around them and even light cannot escape and hence they cannot be seen. Several *Āgamas* give details of their numbers, shapes and sizes. Ācārya Vijay Nandighosh Sūrīji (2001) has summarized their description given in the *Āgamas* and have argued that their description does not agree with the properties of Black holes, yet these concepts were existing in Jain philosophy.

## 9. Law of Conservation

The law of conservation implies that certain entities are conserved in all processes and nothing can be created from nothing. This has been a basic concept of Jainism which led to the concept of eternal existence. According to Jainism, the universe consists of six substances (*Dravyas*):

living beings (*jīva*), Space (*ākāśa*), Matter (*puḍgala*), Time (*kāla*), *dharmaṣṭikāya* (traditionally considered to be the medium of motion) and *adharmāṣṭikāya* (medium of rest). This *ṣaṭdravya* model, what we call as Hexa-D model, is based on the laws of conservation. None of these *dravyas* and hence the Universe, can be created or destroyed and hence they have to be eternal, exist for ever, uncreated and without beginning and end.

Law of conservation is the underlying law of all physical and chemical phenomena, as formulated by modern science during the past few centuries. Energy, mass, velocity, angular momentum, linear momentum etc. cannot be produced from nothing; they are always conserved even as mass and energy are converted from one to another. Similarly particle properties and attributes are conserved in all transformations.

### 10. Causality

According to Jainism cause and effect are related; one has no existence without the other, i.e. every cause has an effect and there is no effect without a cause. This is applicable to living as well as non-living-physical processes. This has led to the theory of *Karma*. In scientific theories, dealing with the physical universe it is termed as Causality.

### 11. Concept of Indescribability

One Jain concept which has found common ground with quantum mechanics is indescribability. *Saptabhaṅgī* or seven modes of predicament enunciated in Jainism has some modes which exists but are indescribable in any language or mathematically (i.e. *avaktavya*). The wave particle duality also predicts that some of their modes cannot be described (Bhandari and Pokharna, 2017).

### 12. Entanglement

Entanglement is relatively new concept in physics. It states that two particles produced in the same reactions are entangled i.e. behaviour of one totally depends on the other, irrespective of separation between them. Their properties depend on each other. This is enshrined in Jain sutra '*Parasparopagraho Jīvānām*' which is the core principle of Jainism. It

states that all life forms are entangled, i.e. dependent on each other; none can exist as an independent entity.

### 13. Determinism

Determinism is the basic law dealing with the physical universe. If one knows the conditions or values of all parameters at any instant of time, involving any process and the laws governing the process, one can predict its state at any time in the future or past. This is the basis of all scientific calculations. In Jainism, this principle is called *Kramabadhha Paryāya* implying that everything happens according to predetermined sequence.

### 14. Newton's First Law of Motion

The law of inertia or Newton's first law of motion states that a body continues to move in a straight line (or remain in a state of rest), unless acted upon by a force. This is implied in many statements given in the *Āgamas*, motion of soul etc.

The laws, concepts and observations listed above are only illustrative and many more doctrines like *Syādvāda* (uncertainty), *Anekāntavāda* (complementarity) etc. can be added which emphasize similarity between Jain philosophy and modern science. Since these have been discussed in detail elsewhere (Bhandari, 2017; Bhandari and Pokharna, 2017) these will not be repeated here.

Apart from concepts and laws of physics, many a discoveries were made by Jain saint-mathematicians during the first millennia of the Current Era and they discovered many rules of calculations, conceived series and subseries and large numbers, as summarized by R.S. Shah (2017), Samani Vinay Prajna (2017) and Anupam Jain et al., (2017). The work of Sridhar (~799 C.E.) and Mahavirāchārya (814-877 CE) related to the Number theory, Fundamental Operations, Set theory, Fractions, Simple, Quadratic, Cubic and higher order equations, permutations and combinations deserve special mention. Nemichandra Siddhanta-chakravarti (10<sup>th</sup> Century CE) deals with 14 sequences, concept of infinity of various types, decimal system etc. in his work *Trilokasāra*. We will not go into details of these because they have been discussed in the papers quoted above. Some of these concepts and numbers are credited to

European mathematicians who discovered them much later, during the past 5 centuries. Possibility of many such concepts and laws described in the *Āgamas* remains unexplored.

Although due credit must be given to Jain thinkers for the above discoveries, there are several aspects of geography, planetary sciences, cosmology etc. where glaring disagreements with scientific concepts are found. Some of these are listed in Appendix 2.

### Appendix- 2

Topics of disagreement between Jain philosophy and modern science:

Most of the discrepancies between modern and Jain concepts relate to units of time (*Koḍākoḍī* etc., larger than the age of the universe) and space, body size of *Tīrthaṅkaras*, astronomy and geography. Existence of two Moons and two Suns, going round the Earth, shape of earth (Disc-shaped Earth) etc. are clearly erroneous because modern concepts are based on rigorous observations. As far as cosmology is concerned, the *Lokākāśa* or the Universe is described as static having a shape akin to a man standing with his elbows stretched out. Theories of modern cosmology and forces of physics indicate that such a structure would be unstable and cannot exist for a long time. The scientific theories and observations can be incomplete in some aspects and are subject to modifications but cannot be wrong since they are based on observations. Thus there is a need to reinterpret *Āgamas* in the light of modern scientific theories and observations.