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Syâdvâda and *Anekântavâd* in the modern scientific context

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ABSTRACT

Anekântavâd, the Jain doctrine describing the real nature of all objects in the universe (dravyas) states that everything, livng and non-living, have an infinite number of modes (paryâya) which coexist but are manifested under different conditions at different times. Thus the nature is multifaceted and multilayered. One may observe a thing or situation from a particular perspective at a particular time but that does not describe it completely; each view is only one partial aspect of it. Some of these descriptions may prima facie be mutually inconsistent or even contradictory, but different views are complementary and, all together, give a more wholesome understanding of the true nature of the object.

Syâdvâdaa 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 (naya). Since no description is complete or wholly true, it must be qualified by the statement that "it perhaps (syât) is like this". The only statement one can, therefore, make with certainty is that no description is certain or complete. Syâdvâdaa thus defines the limits of knowledge and can be called the principle of contextual perspective. In this article we show that the doctrine of Syâdvâda can be compared with the Godel's Incompleteness Theorems which postulate that knowledge about the nature of realty has severe limitations. It is discussed in relation to human understanding which is neither deterministic, nor random but is non-computable as proposed by Penrose.

Jainism postulates that there are three types of knowledge: Known, Unknown and Unknowable. Whereas 'unknown' can be converted into 'known' by study of an object, unknowable can never be known, at least by sensory organs or mind, and can only be experienced by consciousness. Combinations of these three aspects of knowledge about an object, i.e. the

‘known’, ‘unknown’ and ‘unknowable’ give rise to seven (and only seven) states of predication termed as Saptabhangi. The modern concepts of statistics and probability are incorporated in these seven possibilities.

The concepts of syadavad and anekântavâd have enormous scientific importance, specifically in relation to the principle of complementarity, quantum mechanics, wave-particle duality, logic, probability and statistics which are discussed in this article.

In addition Anekântavâd has found practical applications in personal, family and social relations and has led to the concepts of tolerance, compromise, forgiveness, and mutual respect for each other’s views and is essential for harmonious living.

Key words: Anekantavad, Syadvad, indescribability, Wave-Particle duality, Saptabhangi, Naya, Probability, Statistics, Paradoxes

Scriptures Quoted: Bhagvati, Samayasara, Aptamimasa

1. Introduction

The conceptual origins of anekântavâd can be traced back to the fundamental Jain doctrine that everything in the universe (except soul (âtmâ) and paramânu) is an aggregate (skandha), consisting of two or more constituents. Two things can combine in multiple ways and can exhibit multiple properties, at different times, under different conditions, leading to multiple modes. Only soul can be in a pure state and therefore it can exist in this state forever, but when the soul becomes impure by combining with karma¿us, it becomes jiva (living being) and jiva can take many forms, depending on the severity of karmas.

Every object possesses many properties which coexist, without interfering with each other, and only some manifest at any time and others remain latent till the right conditions arise. It is therefore not possible to know all the aspects of its nature. This theory of multiplicity of nature of an object has been called anekântavâd, and it has been variously described as multifacetedness, multidimensionality, relativism, non-equivocality, pluralism, contextuality, non-one sidedness, non-absolutism etc. Acharya Amritchandra (~10th century CE) described anekântavâd in the following way.

“Any real object in the world is existent (sat) as well as non- existent (asat), one and many, eternal (nitya) and non-eternal (anitya), describable (abhilâpya) and indescribable (anabhilâpya), neither this nor that, but both, i.e. this as well as that, in terms of its nature, time, space (pradesha) and material (swaroop, kâl, kshetra, dravya and bhâva)”.

The principles of anekântavâd and syâdavâd have found practical applications in almost all spheres of life such as personal, family, social and political (national and international) relations and led to the concepts of mutual respect, compromise, tolerance and forgiveness for each other's views and is essential for coexistence and harmonious living. These aspects have been discussed by Acharya Mahaprajna (2010), Mukherjee (1994), Samani Shashi Pragya (2014) and others in numerous books and articles. Here, we mainly discuss the concepts of Jain philosophy in relation to the principles of knowledge, complementarity, quantum mechanics, wave-particle duality, probability and statistics and the social aspects are mentioned only briefly.

1.1 Historical background

The concept of multiplicity of modes is the foundation of Jainism and is probably as old as Jainism itself. It developed into a full grown theory of anekânta over time and occupied the central place in Jain philosophy. Several other concepts, e.g. Syâdavâd "conditional description", Nayavâd "specific viewpoints", saptabhangi (seven modes of existence) etc. arose from it as a result of the teachings of Mahâvîra (599–527 BCE), the 24th Jain Tîrthankara.Vibhajyavâda is perhaps the earliest phase of the anekânta doctrine and is mentioned in Sutrakrtânga (1.14.22) where Mahavira instructs his monks that, since they have taken the vow of truthfulness, they should not explain anything without qualifying it with the word syât (perhaps), otherwise the statement will become false. Everything must be explained by resorting to syâdavâd, or by division of issues (vibhâjjavayam ca viyagarejja). Later on Nayavâd (the contextual view point) was developed and concepts of saptabhangi and syâdavâd are found in Bhagavati Sutra (XII. 10.211-226). Although these concepts were integrated into the well developed theory of anekântavâda much later, they formed the subject matter of Astinâsti Pravâda, containing teachings of the Tîrthankaras prior to Mahâvîra, which had long been forgotten and lost.

The earliest reference to syâdavâd occurs is the writings of Bhadrabahu. It is not clear if it was Bhadrabahu I (433-357 BCE) or Bhadrabahu II, who lived around 375 CE. Syâdavâd is also mentioned in the Nyayâvatâra of Siddhasena Divakara (about 480-550 CE). A little later Samantabhadra (about 600 CE) gives a full exposition of the seven parts of syâdavâd or Sapta-bhanginaya in his treatise Aptamimâmsa. It is clear from Aptamimâmsa that syâdavâd was well developed by the sixth century CE. It is the subject matter of Syâdavâdmanjari written by Mallisena (1292 CE). Vimala Dasa's Saptabhangitarangini and other commentaries throw light on the importance these ideas received during the mediaeval period of Indian logic; For over a millennia, the Jain logic based on anekântavâd, syâdavâd 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 their importance in terms of theory of statistics and probability and D.S. Kothari (1985) found its predictions in context of wave-particle duality similar to the solutions given by the quantum theory. G.N. Ramachandran (1980, 1982, 1983), in a series of papers used Syâd Nyâya system (SNS) for developing computer logic and worked out a new formulation of Sentennial Logic and its isomorphism with Boolean Algebra. Some of these aspects have been discussed by Jain (2007, 2011).

2. Limits of knowledge: The Jain view of unknowability

The main question is whether everything can be known about everything or knowledge has any limitations. Science divides knowledge in two parts: known and unknown. As an object or phenomena is studied, unknown becomes known, and eventually, everything becomes known and nothing remains unknown. In contrast Jainism postulates that the knowledge is of three types: Known, Unknown and Unknowable , as schematically shown in Fig. 1. Whereas unknown can be converted into known, unknowable can never be known, at least by sensory organs or mind, and can only be experienced by consciousness. The perception of sensory organs (and mind) have limitations, because they are not perfect and always in a state of learning and improvement, but this is only a trivial reason. The main reason is that everything does not manifest all its aspects (modes) at once, but they are manfested as and when conditions become appropriate, depending on context, cause, interaction with environment, time and place, etc. as discused in an accomanying article (Samani Chaitanya Pragya, 2015).

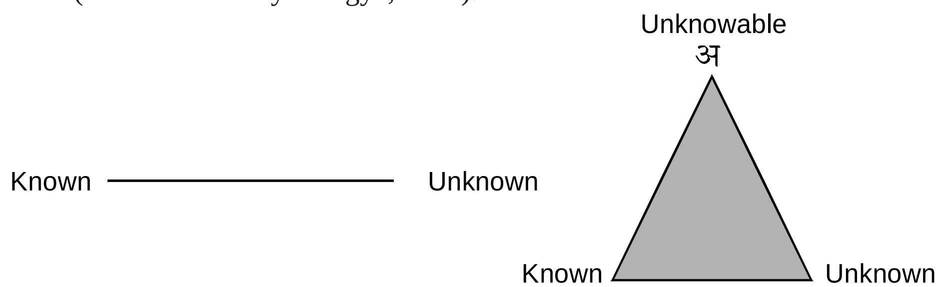

Fig 1. Science view of knowledge having two components, known and unknown, represented by a liner relation (left). Any object lies somewhere on this line. This view is compared with the Jain view of complete knowledge of any object which has three components, known, unknown and unknowable (right). Any object is located somewhere in this triangle.The knowledge of a kevali (omniscient) lies at the left bottom corner of this triangle, where everything is known, and nothing is unknown or unknowable about the object. ¥ represents unknowable or indescribable aspect of the knowledge.

It has been realised, in view of recent developments in modern scientific logic that knowledge has severe limitations. To illustrate the point, we cite two examples here. Because of the finite velocity of light, we are able to observe only the part of the universe, defined by the distance light has travelled over the age of the universe. The velocity of light is about 3x108 meters per second and the universe is about 13.4 billion years (1.1x1015 seconds) old. Light from beyond ~1.3x1023 km can not reach us and we are not able to observe what lies beyond the visible universe outside a distance of 1.3x1023 km. If the universe is infinitely large, then much of it lies beyond this limit and we see only a small part of it. We take the second example of our brain. As we learn about our brain, this information itself evolves the brain and we will never be able to know the state of the brain completely; we can only know its previous state before we examined it. Such a case has given rise to Cantors paradox of infinite sets, in which a set cannot contain all the sets (including itself). We 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, certain chemical composition and its boiling point, freezing point etc. are well defined. However, it also has other properties because of which it is so critical for life processes. Simultaneously it has interesting effects on the human body under different circumstances. Hot water makes one feel good in winter but cold water give good feeling in summer. One can never quantify or write down all the properties and effects of water; some properties, like how much thirst it will quench, will always remain subjective, hidden and come into play at appropriate time. Thus it should be realized that whenever one is describing properties of electron or water, then due to limitation of language in expressing knowledge and the context, it is not possible to describe all its aspects.

We now discuss the work of a few scientists[3] in context of the Jain principles cited above. According to Heisenberg's Uncertainty principle the measurement of energy and time can not be made with precision and there will always be some uncertainty delta, defined by (deltaE x delta t>h) where h is Planck's constant. The

3. A brief introduction to these scientists is as follows*:J.B.S. Haldane, a British biologist, originally at University college, London, settled in India, made important contributions to genetics and origin and evolutionary theories of life. G.N. Ramachandran, a molecular biophysicist is credited with the discovery of triple helical structure of collagen and many proteins. Roger Penrose, a famous cosmologist is known for his contributions to General Relativity, quantum mechanics and neurophysiology. Kurt Godel is known as a brilliant mathematician. P.C. Mahalanobis, a famous statistician was founder of Indian Statistical Institute. D.S. Kothari was a theoretical physicist of repute and educationist. and was Head of the physics Department at Delhi University.He served as Adviser to the Minister of Defence and Chairman of the University Grants Commission.*

laws of physics do not work below a scale shorter than Planck length= hG/2 ðc3 =1.6 ×10-35 meters and Planck time= hG/2 ðc5 = 5.4×10-44 seconds.

As discussed below, in Godel's Incompleteness Theorems, any methodology to understand reality has limitations (See Pokharna, 1977) where these theorems are discussed in light of syâdvâda and anekântavâd). In fact there is much in common between Incompleteness theorems developed during the past century and syâdavâd, propounded at least 2600 years ago. In view of such limitations, any decision must be based on the multidimensional aspects of nature and latent, not yet manifested aspects; otherwise it will lead to erroneous outcome.

3.1 Knowledge and Godel's Incompleteness Theorems

We generally have the impression that mathematical representation, e.g. formulae describing various scientific facts make 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 can not be formulated are lost. Kurt Gödel 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. Similarly, we do not know what an electron really is: a particle or a wave or something else which sometimes manifests as one and sometimes as the other.When electron is observed by a particle detector, it materialises and the other aspect, which was coexisting with it, is lost for ever. It also happens the other way round, i.e. when it is observed as a wave. Thus observation also leads to loss of information.

The two theorems proposed by Godel are:

1. If the system is consistent, it cannot be complete, and
2. The consistency of the axioms cannot be proven within the system.

These are briefly explained below.

3.2 Gödel's first Incompleteness Theorem

This theorem states 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 elementary properties e.g. of the counting numbers. 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 cannot 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 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.

3.3. 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 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 show a need for a concept of consciousness which may provide a better description of reality. It is consistent with the Taoist maxim that truth can never be written down or expressed in words and whatever can be expressed in not the truth, at least not the complete truth.

4. Anekântavâd: Theory of multiple manifestations of reality

All living beings and non-living things are interconnected (or entangled) with each other in a highly dynamic way, according to the Jaina theory of mutual dependence, aptly described by the sutra Parasparopagraho jivânâm. The Universe is made of different parts which are influencing each other through complex interactions. Thus in a brain, various thoughts interact among themselves and one or a few thoughts dominate at any given instant. After some time, some other thoughts dominate one’s mind. So decision taken on the basis of the first set of thoughts may not be meaningful at a later time. Hence, consistent with the concept of syâdavâda, a certain decision taken on the basis of an instantaneous impulse considering only the present state may not be a correct decision. A correct decision should take into consideration all probabilities including those, presently hidden and indescribable, which may manifest in future. Such a balanced decision will be more lasting and fruitful. In this context, simulation studies which consider some probable scenarios are desirable.

In Jaina view of Anekânta, reality is varied and variegated and encompasses all aspects of life. There can be multiple ways, views and approaches to comprehend reality. Each view is incomplete in itself but different views complement each other and, together, they give a more wholesome understanding of reality. However, it is not possible to describe anything completely, because number of modes in which a given “thing” can exist are many, very large or even infinite.

4.1 Nayavâd

Anekântavâd has essentially evolved from Nayavâd which can be defined as perspective from different stand points. It is based on the fact that all objects in the universe possess a large number of modes of existence (paryâya). One may visualize a given thing or situation from any one of these stand points or modes (nayas). There are several nayas such as samagra naya (holistic view), vyavahar naya (practical view), nischaya naya (definite view), rajushthra naya (current view), naigam naya (end use), shabda naya (synonymous view), samviruddha naya (etymological view), and avambhoot naya (simile). To these nayas can be added the philosophical view, scientific view etc. Each of these views holds good only in a limited context, i.e. these views are valid only under certain conditions and do not describe a particular thing or situation in totality or in an absolute sense.

In view of the above discussion, Anekânta has been variously interpreted as the theory of many-foldedness, multi-facetedness, multi-layered, multi-sidedness, multi-perspective view, contextuality, pluralism, co-existentialism, non-absolutism, non-equivocality and relativism. S. Mookerji (1994) calls it the theory of non-one sidedness, implying the many sided nature of reality. We prefer to call it theory of multiple manifestations. In the physical world, as in the philosophical domain, things or ideas have plurality of attributes, with some in agreement , some indifferent and some apparently contradictory or conflicting with others. Anekântavâd successfully takes a synergetic view, and assimilates them and establishes harmony between the various views. Considering them together in totality, gives us a more complete description of the true aspect of reality. Thus, according to anekânta, each standpoint should be considered only as partial truth that holds good in relation to a particular context. Thus, different contexts or perspectives depend upon or are related to physical as well as the mental frames of reference of the knower (or observer) and hence anekântavâd has also been termed as Relativism. Because of the usage of the term "relativity", Anekânta is sometimes, and erroneously, compared to Einstein's theory of relativity. Hence we think it necessary to clarify that such a comparison is not appropriate, and the similarity is only valid to a limted extent.

4.2 Comparison with Theory of Relativity

In the Special Theory of Relativity (STR) the parameters of motion of an object (velocity, time, spatial dimensions) depend on the frames of reference of the observer and the object, their motion (or acceleration), relative to each other. If one is looking for similarity between the special theory and anekântavâd, it can be said that knowledge about an object depends on the perspective of the observer, i.e. his frame of mind. To extend the analogy further, as envisaged in STR, time and space (and motion) are not absolute, so also in anekânta, description of the nature of a thing is not absolute but relative. Thus as far as the question of similarity between syâdavâd and Special theory of relativity is concerned, we can say that the perceived knowledge of an object depends on the mental frame of reference (or perspective of the observer), just as the perceived motion of an object in STR depends on dynamical frame of reference of the observer. For this reason, in Jain philosophy anekântavâd is termed as relativism. We feel that only to this notional extent, anekantavad and Relativity have a common approach. In essence, their subject matter and domains are very different and no further similarity is warranted.

4.3 Inherent Uncertainty in a description

It is clear from the above discussion that when any of the naya propositions or standpoints are stated categorically with certainty, i.e. "this is it" and is claimed to be absolutely true, actually the statements turn out to be false.

Sometimes anekântavâd is contrasted with ekantavad (monism), the latter standing for a particular or definite and categorically well defined philosophical position. Such an emphatic assertion, as discussed above, would not only be incomplete but also incorrect.To describe it differently, anekânta always denies universality of a law. Thus there is always an uncertainty or incompleteness and absence of universality in every proposition.

Anekântavâd can be practically demonstrated through a Buddhist parable as follows. A Buddhist monk in China was approached by the king who lamented that the Buddhist philosophy is very complicated and asked the monk to express its essence in a simple way. The monk sought a day's time to explain it. The monk fixed mirrors at various angles on all the sides of a hall, its floor and ceiling and installed Buddha's statue in the centre. The mirrors reflected infinite views of the Buddha. He invited the king to see for himself and explained "The essence of Buddhism is that the whole universe represents multiple reflections of the self (Buddha mind)". This anecdote amply demonstrates the philosophy of anekânta. One gets infinite views of the same reality, depending on how the observer perceives it and not all the views can be seen simultaneously, at a given instant of time. This is the essence of Anekânta.

4.4 Anekântavâd and the physical reality

Anekânta is not merely a philosophical doctrine but is deeply rooted in physical reality, giving a correct description of nature of things. Science, in comparison, gives only a partial description of objects depending on what is being observed and the technique employed for the observation. Yet, to understand the principle of anekântavâd scientifically, we take recourse to quantum physics. As already mentioned above, it has been shown experimentally that a photon or electron (or any elementary particle) sometimes behaves as a solid material particle, like a grain of sand, 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".

4.4.1 Gross (macro) and subatomic (micro) worlds

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.We note that 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, shape and colour. 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 in gross matter, although they coexist in it 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 Jaina concept of matter, as we go down in size, paramâ¿u, the smallest particle of matter (which is not the same as "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 (paryâya) for a complete description.

4.5 Anekântavâd and the principle of Complementarity

Scientifically, the closest approach to understand anekântavâd is by the "principle of complementarity", which is also the cornerstone of modern physics. Complementarity is quite a revolutionary and significant concept in quantum 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.

The phenomenon of particle-wave duality apparently seemed contradictory to commonsense since it was presumed that a photon or an electron should be a solid material particle and cannot be a wave which is just a vibration. Certainly it cannot be both. Bohr explained this seemingly contradictory behaviour by stating that particle and wave are two complementary, albeit contradictory, aspects of their true nature. He used the Chinese concept of Yin and Yang, which have opposite characteristics (colour, orientation, eyes etc. of the fishes) but coexist and both are required for the sake of completeness. Anekântavâd goes a step further and states that it 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 paramâ¿u. To illustrate this point, Kothari (1985) considered a particle in a box and divided the box in two compartments A and B. If one then asks the question "In which box the particle could be", one gets a number of answers. We will take up this example later on in context of saptabhangi.

Anekânta not only accommodates but takes a synergetic view between seemingly contradictory propositions in several aspects of daily life, philosophy, 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 anekânta emphasizes that some of the aspects can, however, be indescribable or inexpressible. Questions which cannot be answered unambiguously, either in the affirmative or negative, such as the existence of soul, can be dealt within the framework of inexpressibility. In essence, anekânta 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 behaviour of things.

Anekântavâd has many consequences for its practical application and we discuss two of them, syâdavâda and saptabhangi here.

5. Syâdavâda and contextual relevance

Syâdavâd 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

[5] *This principle of contextual uncertainty has nothing in common with the Heisenberg's Principle of Uncertainty in physics and should not be confused with it.*

contextual and there is no unique, absolute, complete truth although some element of truth exists in every 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 wholesome and 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 Syâdavâd or the Jain Principle of contextual uncertainty.[5] We would like to emphasise that it is not Sanshayavâd or doctrine of confusion or doubt but is a doctrine of truth.

Syâdavâd proves the relativity of predication. This is best illustrated by the Jain parable2 of an elephant and the six blind men, each of whom look at different parts of the elephant, i.e. legs, trunk, tail, ears, body, and tusk and describe it differently, i.e. as a pillar, branch of a tree, rope, hand fan, wall and solid pipe, respectively. The problem was resolved when a wise man explained to them that the elephant has all these features and they all are partially right and none is completely correct.We conclude this discussion by defining what exactly syât means. The one which always contradicts a universal law applicable in all circumstances is called syât"6. This rule is infallible, it is claimed, although such a statement contradicts the rule itself.

6. Seven modes of predication: Saptabhangi

Saptabhangi,literally meaning seven modes of existence, is a practical application of syâdavâd which states that every "thing", living or non- living, can exhibit seven modes of manifestation These seven modes of saptabhangi are :

The dialectic of sevenfold predication (saptabhangi)

(1) May be, it is;

(2) may be, it is not;

(3) may be it is and it is not;

(4) may be it is indescribable;

(5) may be it is and yet is indescribable;

(6) may be it is not and it is also indescribable;

(7) may be it is and it is not and it is also indescribable."

6.1 Saptabhangi and wave particle duality

6. *जो सदा नियम का निषेध करता है और निपातरुप से सिद्ध है, उसे स्यात कहा गया है। वह वस्तु का सापेक्ष सिद्ध करता है।*

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 "Complementarity 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 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 behaviour of the particle.

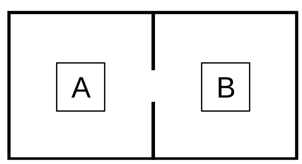

Fig. 2 Particle in a box

Again, for an electron behaving as wave as well as particle, one can think of the following seven possibilities:

1. May be Electron is a wave.
2. May be Electron is not a wave (but a particle).
3. May be Electron is both a wave and a particle.
4. May be Electron is indeterminate.
5. May be Electron is some times a wave but its real nature is indeterminate.
6. May be Electron is sometimes a particle and is real nature is indeterminate.
7. May be Electron is both, a wave and a particle and its real nature is indeterminate.

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. If we further extend this approach, following Haldane, Mahalanobis and Ramachandran we find that Syâdavâd can have applications in probability, statistics and logic, briefly discussed below.

7. Syâdavâd and Probability

Since for every object seven states are probable, each state has a finite probability of existence. Thus the concept of probability is ingrained in Sapatabhangi. According to the modern experiments, an electron may exist in any form but it materialises as an electron (pelectron=1) when one observes it by a particle detector. Again it is detected as a wave (pwave=1) only when one sets up an experiment to observe it as a wave. Probability (p) is inherent in the concept of saptabhangi, even while not considering indescribability. When we assert that a thing exist (p=1) as well as it does not exist (p=0), it is automatically implied that it has a value in between (p= 0 to 1). In fact if we include indescribabilty, then p belongs to a three valued (dimensional) system and value of p can be anything. Mahalanobis (1957) mentions that "There are certain ideas in Indian-Jaina logic called Syâdavâd which seem to have close relevance to the concept of probability, and supply a convenient background ......on the foundations of statistics " and makes several points which may be summarised as follows.

1. The seven categories, defined by saptabhangi, are necessary and also sufficient and exhaust all the possibilities of knowledge. "… the fourth category out of the seven categories, is a synthesis of three basic modes of "it is" (assertion), "it is not" (negation) and inexpressible or indefinite, or "indeterminate" (which itself is resolvable into either "it is" or "it is not") and supplies the logical foundation of the modern concept of probability". Syâdavâd differs from the probability theory in one respect; in the modern probability theory, the sum of all probabilities is unity whereas in case of Syâdavâd, which is more general, some indeterminism, which is inbuilt in nature, always remains.

2. "A real is a particular which possesses a generic attribute. This is very close to the concept of an individual in relation to the population to which it belongs. The Jaina view, in fact denies the possibility of making any predication about a single and unique individual which would be also true in modern statistical theory.

3. There is an emphasis in Jaina philosophy on the relatedness of things and on the multiform aspects of reals which appear to be similar to the basic ideas underlying the concepts of association, correlation and concomitant variation in modern statistics. Mahalanobis brings in stochastic processes also when he writes "The Jaina view of "existence, persistence and cessation" as the fundamental characteristics of all that is real necessarily leads to a view of reality as something relatively permanent and yet relatively changing which has a flavour of statistical reasoning. "A real changes every moment and at the same time continues" is a view which is somewhat sympathetic to the underlying idea of stochastic processes"

. In Syâdavâd, the qualification “syât” that is “may be” or “perhaps” must be attached to every predication without any exception. Hence all such predications are similar to the concept of “uncertain inference” in modern statistical theory.

8. Syâdavâd and Logic

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 Syâdavâd predicts.

According to the western thinking, the knowledge can be of two types, known and unknown. As we study more, unknown is converted in to known and eventually everything becomes known. The Indian thinking does not subscribe to this logic. According to Jaina philosophy the knowledge is of three types, known, unknown and unknowable (by sensory organs). Thus there is clear limitation of knowability. Though the unknowable can be experienced, it cannot be described. Language is incapable of describing it and this knowledge is beyond logic.

9. Haldane’s approach to link Syâdavâd with mathematics and psychological decision making:

Haldane (1957) has given a new dimension to Syâdavâd. Starting with a simple equation, if $x^2 - 3x + 2 = 0$, then x=1 or 2 , one cannot say that the probability that x=1 is greater than, less than or equal to the probability that x = 2. More data are required to decide their relative importance. Further if $x^3 - x^2 + x - 1 = 0$, then there are three solutions: x =1 or x= $\pm\sqrt{-1}$

The last two solutions $\pm\sqrt{-1}$ are indeterminate and were inexpressible till complex numbers were discovered.

Further the equation $(x^2 - x)\cos x = 0$ (modulo 2) gives seven (and only seven) solutions:

0, 1, अ, [0 or 1], [0 or अ], [1 or अ], [0 or 1 or अ] where अ stands for avyakta (अ ±अव्यक्ता) or indescribable. This equation correctly describes saptabhangi.

Application of Syâdavâd in psychological decision making is illustrated by a simple experiment in which sensitivity of a person’s eye is examined for increasing illumination levels. Seven possibilities, similar to the seven predications of Saptabhangi emerge, as follows: When the illumination is much below or above the threshold sensitivity, the answer is clear no or yes. but as the illumination level approaches the threshold,either he sees it but is not sure (indeterminate), or does not see it but is not sure; now he sees it and now he does not; is not sure whether he sees it or not (indeterminate) and he sees it and also does not see it and is unsure.

This example can be extended to other sense organs (ears,, taste etc.). Numerous examples can be given, which will illustrate that every moment in real life, whether we are seeking a goal or result of an action,we always live by Saptabhangi and have seven possible outcomes; either we will achieve the anticipated result or not or we may achieve some unpredictable result and combinations thereof.

10. Syâdavâd and Anekantavad in interacting systems, Networking and Systems Theory

Syâdavâd and Anekantavad can also be better understood in modern terminology, using concepts of interactions, networking and systems theory. Interaction has a profound implication in science as also in Jainism and implies relationship between two or more than two entities in nature. The bodies in questions can be physical or biological or their combinations. Movement of Earth around the Sun by gravitational interaction is one such relation, which is dynamic. The other relation could be between a biological system and its physical or biological environment. If we increase the number of such bodies in each of these examples, then we have more complex systems and instead of two body problem we have to consider many body problem and essentially we have a number of parameters which have dynamic values.We have therefore to consider the whole system, made of many subsystems (parts), which interact with each other and at the same time provide feedback to the system. A typical family, e.g. with two parents and two children, each member having multiple talents, views, perspectives and relational attributes towards each other, can well illustrate the importance of anekântavâd as the relationship is multi-layered, multidimensional and dynamic and changes every moment. Certainty as well as indeterminacy or uncertainty is a part of every decision making process and one must resort to Saptabhangi for correct appraisal of the situation. Syâdavâd and Saptabhangi thus plays an important role in any decision making or making a choice between various options.

11. Psychological decision making and Quantum physics

We now show that decision making involves the uncertainty defined by Syâdavâd i.e. one has to choose between various possibilities defined by Saptabhangi. For this purpose, we first briefly review the present understanding of consciousness, brain and reduction process, leading to decisions, mainly based on the work of Penrose (1999), P.M.Agarwal and R.C. Sharda (2012), and Penrose and Hameroff (2014).

We begin with a brief outline of brain function (see e.g. accompanying article by Sanchetee et al., 2014). There are over a 100 billion neurons in the brain which receive and process electrical and chemical nerve signals.The connection between neurons is made via synapses. The decision is not made at neuron level and is not a classical phenomena because it is not a binary choice between yes and no (see the accompanying paper by Pokharna for details). This unpredictability of decision must therefore be attributed to quantum mechnical phenomena.Neurons can not be involved in decision making because they are too big, 0.4 to 100 microns wide and upto several meteres in length. Inside neurons there is a "cytoskeleton", the structure that holds cells together, whose "microtubules" (hollow protein cylinders, about 25-nanometers in diameter) control the function of synapses. Penrose suggests that 'consciousness' is a manifestation of the quantum cytoskeletal state and its interplay between quantum and classical levels of activity.We must point out here that, according to Jainism, consciousness is a characteristic of the soul and a non-material tattva. It is neither a material product nor a material phenomena. What Penrose calls as a decision taken by consciousness is actually, according to us, a voluntary decision, what we colloquially call as conscious decision making.We now discuss the way a voluntary decision may be taken by brain from multiple choices available. This is termed as subjective reduction.

Subjective reduction is made according to the Copenhagen interpretation of quantum phenomena. Suppose the system is in a state consisting of "superposition" of many possible states and when a subjective decision is made, the system reduces (or "collapses") to a specific state as per the subject's choice, that is if the subject wants the system to behave like a wave then it will act as a wave, but if the subject wants the systems to behave as a particle then experimental setup can be adjusted accordingly, such that it will act as a particle. Circumstances offer multiple options for taking any decision and there are always choices available through what is known as free will.

At the same time, it may be noted that the brain and its memory repository, which is believed to be holographic in nature, are not localized, i.e. are non-local. When an object is under observation, its sense of colour, shape and motion, for example, and their corresponding "locations" in the visual cortex are situated in different regions and are sensed at the same time (known as the 'binding problem'). How does one, then, have a feeling of simultaneity in these three different observations? Also it is not known, how the processes occurring in the sub-conscious mind are different from those taking place in the conscious mind.

We now discuss the role of quantum physics in decision making process. In general, quantum systems may be existing in many possible states, but when we try to perform a measurement, it shows only one of these possible states. Quantitatively, one can only give probability of finding a quantum system in a given state. Hence there is an inbuilt uncertainty in description of any quantum system.

In order to explain the complex behaviour of brain and its constituents like neurons and synapses, along with the experimental observations in psychology and neurophysiology, like discreteness in behaviour of consciousness, time delays in stimuli and action taken (in advance of stimuli), free will, binding problem, working of subconscious mind etc., Penrose and Hameroff (2014), have made an attempt to explain "consciousness" by combining, neurophysiology with quantum physics and general theory of relativity. Entanglement is another property of quantum physics which can explain the strong interconnectedness, and a consequence of association of large parts of neurons and synapses that is not reducible into the properties or individual neurons and synapses. As mentioned above, neurons contain some finer structures known as microtubules which in turn consist of thousands of very small constituents knows as tubulins. The tubulins consist of two parts which are of 8x4 and of 8x5 nanometers in size and behave like quantum physical system. Millions of such tubulins, spread among thousands of neurons, can collectively oscillate and can produce a large quantum mechanical state, essentially a quantum superposition state. Such oscillations are made possible through gap junctions among synapses and neurotransmitters. Actually one can have a superposition of several such states, which can be described by Schrödinger wave equation. They then argue that this superposition state is unstable and reduces to one of the possible constituent states. This reduction is called as Orchestrated Objective Reduction (Orch OR). The word orchestra is being used as thousands of tubulins are participating in this process like an orchestra. The reduction of superposition state takes place due to extremely small gravitational self energy difference between two states of group of tubulins. The time when this reduction takes place is governed by the Heisenberg's Uncertainty principle. After the objective reduction, one is left with just one classical state of the brain. They call this process of Objective Reduction in which transition takes place from quantum physical reality to classical reality as "conscious decision making". Models are then developed to link it with neural correlate of consciousness like 40-80 Hz gamma waves found in EEG patterns (see the accompanying article by S.V. Shah). They believe that the majority of activities taking place at subconscious level are quantum mechanical in nature.

They proceed further by using quantum gravity, combining quantum physics with General Theory of Relativity to derive a model of conscious decision making process. There is a speculation that information can be stored in spin foams of quantum gravity, at Planck's lengths that is around 10-34 cm (which is 20 orders less than the size of an electron). Thus according to Penrose and Hameroff, space-time geometry can store information and that can play an important role in determining major operations of the neurons and hence of our brain, including the Orch OR. Penrose (1999) had earlier speculated the possibility of Objective Reduction at

Planck level. He extended General Theory of Relativity to Plank level and argued that a particle at certain location will have some space-time curvature and the same particle in some other location will have opposite space-time curvature. Hence a superposition of the two will form a quantum superposition state. This will be like a bubble with opposite curvatures and will remain unstable, till the energy corresponding to the two states exceeds certain threshold of energy and time, governed by the Uncertainty principle. Beyond this, an Objective Reduction of the quantum state will take place and only single state will be obtained. Some of these arguments are still in a preliminary state of investigation. However, the model implies that uncertainty in our determinism exist at the very finest level.

Thus, according to Penrose, the 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. To summarise, the Penrose model presupposes that space-time geometry can have information in spin foams at Planck level when we consider quantum gravity. Reduction of quantum superposition at this level is governed by the energy difference between two quantum states of a particle. A similar Objective Reduction occurs at brain level through "tubulins", the quantum systems operating within neurons through microtubules. Both have inbuilt uncertainties in them based on the perspective, and is in conformity with the concepts of Syâdavâd.

12. Syâdavâd and Logic

G.N. Ramachandran (1981,1982a) and Jain (2007) have developed logic systems based on Saptabhangi, which can be used in computer applications. Jain (2007) has shown that the proposition with two assertions:

- It exists (A) and It is indescribable (अ) leads to four logic states:
- It is true (T) if affirmed A is consistent with not affirmed ¥ ;
- It is false (F) if अ is affirmed and A is not ;
- It is doubtful (D) if both A and अ are affirmed;
- It is empty or null (X) if both are not affirmed.

Ramachandran has shown that Saptabhangi can be reduced to a vector-matrix description of binary logic, based on which computer logic can be developed.Classical logic permits only binary propositions i.e. true or false. However, there exist certain propositions with variable answers representing partial knowledge. Furthermore, since fuzzy logic is a form of many-valued logic and deals with reasoning that is approximate rather than fixed and exact, it can be developed from the concept of Saptabhangi, There is a certain amount of vagueness in fuzzy logic as compared to the binary logic. Fuzzy logic variables may thus have a truth value that ranges in degree between 0 and 1 and has been developed as an infinite-valued logic. Fuzzy logic has been extended to handle the concept of partial truth, where the truth value may range between completely true and completely false and has been applied to many fields, from control theory to artificial intelligence. Both degrees of truth and probabilities range between 0 and 1 and hence may apparently be similar but Fuzzy logic and probability address different forms of uncertainty.

13. Resolution of paradoxes

Many paradoxes can be resolved using the criteria given by Saptabhangi, but not in terms of binary logic of yes and no. Ramachandran, (1981; 1982 a,b.) has formulated the logic using Boolean algebra and has shown that a solution to various paradoxes can be found within the framework of Saptabhangi. We illustrate this concept with a few paradoxes here which were known to the Greek philosophers and bear their names.

1. Cretan Liars paradox
2. Double statement paradox
3. Barber of Seville Paradox
4. Cantors paradox of infinite sets
5. Theseus paradox of ships and question of identity

We illustrate the concept in the case of Cretan Liars paradox : “A man says that he always tells a lie. What he said is true or false?” One cannot answer it without contradicting the man’s statement. It is illustrated in the following example, where one starts with “x is not true” and one concludes that “x is true”

Suppose: 1. If x = “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.

4. Therefore: x “x is not true” (QED)

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[7] *Many paradoxes can be formulated if two contrary statements are made e.g. 1.”The following sentence is true.”2. “The previous sentence is false.”.*

[8] *"There is only one barber in town who shaves all those, and only those men in town who do not shave themselves.”*

Then “Who shaves the barber?” According to the statement above, he can either shave himself, or go to the barber (which happens to be himself). However, neither of these possibilities are valid: they both result in the barber shaving himself, but he cannot do this because he shaves only those men “who do not shave themselves”.

By using options given by saptabhangi, it can be said that either it can be true or it can be false or it can be indeterminate and other combinations thereof given by the seven possibilities described above. The Double statement paradox[7] or Barber of Seville Paradox[8] can also be resolved in a similar manner. Cantor's paradox of infinite sets is similar to Godel's incompleteness theorem that there is no set which can contain all the sets including itself, implying that nothing can contain everything.

13.1 Theseus Paradox and question of identity

If each part of a ship (A) is removed and replaced, one by one, till all the parts are replaced, will it remain the same ship (A) or it becomes a different ship? This is a question of identity known after Theseus as recorded by Plutarch in life of Theseus from the first century CE. Obviously it is difficult to answer this question either in the affirmative or negative. The paradox was extended further by Thomas Hobbes who proposed that if each removed part is reassembled in to a new ship (B), the ship B is the same as A or different?, again with divided opinions. Much before Theseus, the problem was resolved by Mahavira in context of rebirth by propounding the role of soul, which is the 'essence' of a living being, does not get destroyed at the time of death and provides the continuity fom one birth to another. During a discourse on rebirth according to Buddhism," Is the person who is reborn the same as the one who has just died or different?" asked the king. Nagasena replied that he is neither the same nor is he different. Just as the last flame of a lamp , burning all through the night, is neither the same as the first flame nor different". The answer to these puzzles can be found within the framework of Saptabhangi. The ship, the newly born, and the flame, all are the same, different, same as well as different, neither the same nor different, indeterminate and combinations thereof. It depends on the perspective as to what is being considered as the identity, material or its use. In effect, it is cessation of one and creation of another, while the essence remains the same.

14. Application of Anekântavâd to harmonious living in personal, family, social, national and international domains

Life consists of a series of decisions. One has to make a decision every moment, during contemplation, planning and execution. Even when one is not taking a decision, it is a result of a decision "of not taking a decision". Actually, one cannot live without taking a decision. Every decision involves choice. Normally choice can be either yes or no; This concept is fallacious. A particular choice will lead to the desired result or not is hard to visualise a priori, because in reality, every decision involves seven choices. 1.It will work; 2. it will not work; 3.It may work beyond our expectations, but we cannot predict it now (indeterminate); 4.It may work below our expectations but is unpredictable (indeterminate); 5. It may work but in effect it will not give the desired result; 6. It may not work but in effect it may appear to work if it gives the desired result; 7.It may lead to some altogether unpredictable result. Such a situation exists in all domains, in personal, social, management etc. These aspects have been discussed in many books and articles (e.g. see Mahaprajna, 2010); Samani Shashi Pragya, 2014) and will not be discussed here. In the modern context of information technology we, however, need a decision support system (DSS) which will go beyond yes and no i.e. asti, followed by counter choice (nasti or alternative). These two options do not lead to correct decision and for the modern life style, encompassing all its aspects, a proper Decision Support system can be developed for arriving at correct decision within the framework of Syâdavâd and Anekântavâd (Pokharna,2013a,b).

15. Comparison with other doctrines

The universe consists of an infinite variety of things. Three different doctrines have been propounded in various oriental thoughts: Advaitavâd (non-duality or monism), Dvaitavâd (duality) and Anekântavâd (infinite possibilities) to understand their origin and nature. The first proposition, Advaitavâd, is that everything we see around has emerged from 'one' (ek) and they all have a single core tattva. Thus advaitavâd (literally meaning "not two") implies that everything is a manifestation of " one". Thus if in the beginning there was only "one", logically "many" (anek) can not originate from "one" because, according to causality, for anything to materialize requires a cause. Without a cause " one " would exist as it is, remaining unchanged for ever. Existence of a cause requires something other than the "one" (i.e. at least "two"). Causality requires existence of at least two entities to interact with each other and give rise to "many". Many coming out of "one", without a cause, violates the principle of causality and therefore this proposition rejects "advaitavâd" (non-duality) and necessitates the concept of "dvaiatvâd". In the latter case, everything emerges from the interaction of purusha and prakriti. Anekântavâd goes a step beyond this. It emphasizes that the " one " has infinite attributes and thus one and many become the same. Thus Anekânta offers a true and complete description of the physical reality. In a nutshell, Anekântavâd emphasizes that this is true (but only partially) and that also is true. Contrasting it with the upanishadic concept of neti wherein the upanishads look at the existence of God in every conceivable manner or object 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, Anekântavâd asserts it in the affirmative "This is true and that also is true".

16. Concluding Remarks

In this article we have brought out the scientific importance and merits of Syâdavâd and shown that Syâdavâd can be used to define the limits of knowledge and finds applications in quantum mechanics, logic, probability theory and statistics.

Anekantavâd helps us understand the true nature of soul as well as matter and Saptabhangi represents various choices available to us in life and options from which decisions have to be made.

The principle of Anekantavâd is generally considered as a philosophical concept, having many application in social domain. Thus, besides explaining the true nature of "things", conceding that all views have some element of truth, as explained in this article, Anekântavâd has been widely and successfully applied in day to day life for understanding and harmonizing diverse, often contradictory, personal, domestic and societal issues, as also philosophical and spiritual views, to reduce conflicts between different cultures, faiths, religions and societal matters. It has been shown that this single concept can lead to harmony in day to day life, between groups of people and between nations and promote coexistence. Thus, the unique concept of Anekântavâd, can bring harmony in various spheres of life and reduce conflicts. Much has been said and written in the praise of Anekântavâd. Understanding of Anekânta is essential for attaining correct perspective in life as well as the correct world view or samyak darshan, essential for attaining enlightenment.

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