Exploration of General Systems Theory (GST) and Jainism may provide new frontiers of knowledge and evolution

Dr. Surendra Singh Pokharna[1]

Abstract

This paper summarized limitations of the scientific methodology and the concept of knowledge which is currently used to study living systems and human systems. It includes limitations caused by Godel's incompleteness theorems. It is suggested that we need to explore the General Systems Theory (GST) for better understanding of these issues. It is shown that the concept of Jainism that knowledge is structured in the consciousness needs to be examined in the modern context. It is also illustrated that scientific knowledge is just a subset of a much wider concept of knowledge which is structured in the consciousness. Hence it is also mentioned that since knowledge of science has limitations, so ideas about knowledge of consciousness may lead to new frontiers of knowledge not yet recognized in modern science. They lead one to infer that there exist higher dimensions of knowledge including Extra Sensory Perception (ESP) which are not yet properly explored in a systematic way.

Some examples are given which shows that the concept of knowledge of consciousness has a great meaning and they can be good examples to be pursued by the scientists. First concerns with remarkable memory of Swamy Vivekanand. Second example concerns with Shatabhdhanies, who demonstrate highly evolved mental faculties through which one can perform hundreds of activities together in a sequence without using any pen and paper. The third provides a quantitative table which indirectly indicates that ancient Jain Acharyas have attempted to estimate the size of the smallest particles of matter and the sizes which they have arrived at are statistically significant and are quite comparable to the sizes of the modern elementary particles of matter.

As a consequence of this, it is also mentioned that Darwin's principle of "Survival of the fittest" should be compared to a wider principle "Live and Let Live" of Jains based on the

1 (Former Scientist, Indian Space Research Organization), Email: sspokharna15@yahoo.com, Phone No. 91-79-26925850 ®, 09825646519 (M), Ahmedabad, Gujarat, India

higher dimensions of knowledge which emphasize more on underlying identify (common soul) among all living beings than differences among them.

Finally it is proposed that the process of enlightenment as described in Jainism to achieve the highest state of soul is accompanied by a decrease in rate of entropy production and decrease in resource consumption at every stage. Hence there is a need to talk of some Order parameter like Syntropy.

Keywords: Scientific knowledge, Knowledge of consciousness, Soul, Shatavdhanie, General Systems Theory, Order, Size of atoms and nuclei, Extra Sensory Perception, Survival of the fittest, Live and Let Live, Entropy and spirituality.

This paper is dedicated to my mother Late Shrimati Lahar Kunwar Pokharna, who has laid foundation for doing this type of work.

1. Introduction

Science and technology and their use in economic developments and commercialization have revolutionized the whole world in such a way that everything appears to have changed in last 100-200 years. Developments in the field of space technology, atomic energy, electronics, biotechnology, modern agriculture, telecommunication, and manufacturing systems are some of the examples of these changes. However, they have also resulted in an increase in population, depletion of natural resources, damage to the environment, increase in terrorism, threats of nuclear wars and so on. These changes also have played a key role in making this world truly global. However, all these consequences have resulted in a large scale increase in entropy in the world at different levels in different fields (Pokharna 2012). In addition, because of these changes and domination of science and technology in all walks of life, an impression has been created that scientific knowledge is the supreme and anything other, which does not fall into this domain is not very relevant. But Science and technology are just two hundred years old only and there was a concept of knowledge and technology even before the modern science came into the existence.

Actually one finds that scientific methods developed to study the physical systems are not adequate when human systems are also included in this type of formalism (John Gigch, 1978, Bertalanffy, 1976), because all living systems are essentially irreversible in nature, that is they grow and decay and they are open systems compared to the physical systems which are closed systems. So the biological and social systems cannot be strictly subjected to the process of measurement and hence they are not exactly describable in the strict terminology of the physical, sciences. Also any type of experimentation is not possible in case of human systems

(Goldsmith 1990, Jones 1990 and Penrose 1990), as they have memory, free will, creativity, tendency to interact strongly with other fellow beings and the environment. Furthermore there are micro controls in the form of thought processes which cannot be easily adjusted in any planned "scientific experiment". They also have a property of infinite amplification because of the thought processes, which makes it difficult to make them study in a strictly scientific way. Expressed in a different way, it is now felt that the standard concepts used in any scientific study like compartmentalization, reductionism, causality, mechanism, induction, empiricism and passivism etc. (Goldsmith, 1990, Jones 1990) cannot be used to strictly study the biological systems and social systems. Not only this the basic parameters used in science like energy, mass, linear momentum and angular momentum are basically defined for closed isolated systems, so they may not be the best choice for describing the biological and social systems (Penrose, 1990 and John Gigch 1978, Pokharna 2012). The final blow to limitations of scientific methodology is being done by Godel's incompleteness theorems (Penrose, 1990) which have virtually shaken the foundation of modern science. Therefore a totally new perspective and new concepts are required to handle the modern problems of the society.

Hence General Systems Theory (GST) is used for better understanding of the whole problem because by its intrinsic nature, GST can give a better picture of the interconnectedness of various components of the Human-Earth-atmosphere system. It is finally a problem of order versus disorder (Pokharna, 1985, Pokharna 1991, Pokharna 1996 and Pokharna 2006, Pokharna 2010 and 2012) at all levels and so when we talk of development and evolution, we should talk aboutthe development of the order and evolution of order for complete understanding of the term development. They will have significant impact on all the problems of the modern life.

It also appears that it will be necessary to explore the concept of consciousness for better handling of the current problems and its connection with the knowledge. It is here that the concept of knowledge as enunciated in Indian philosophy in general and Jainism) in particular needs to be brought into the picture. (For brief description of Jainism, see appendix 1.Actually the Jain concept of knowledge is so extensively discussed with five different types of classes of knowledge that it needs to be further explored in view of modern concepts of knowledge in computer science and the neurosciences. Thus this paper emphasizes that scientific knowledge has limitations and there can be knowledge beyond science and still meaningful. Thus it is mentioned that the concept of knowledge needs to be enlarged further by taking consciousness into account

There is another dimension of this problem and this deal with the direction of development and evolution in general. At the modern time, the concept of development is governed by the ideas of economic development whereas in the case of evolution, we talk about Darwin's principle of evolution. However, in Indian philosophy in general and Jainism in particular, we

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

In view of these issues, it is observed that most of the development in science and technology and their economic exploitations have resulted in a large increase in the entropy at all levels starting from the human brain to the whole biosphere. Hence the concept of "order" as defined in the case of General Systems Theory needs to be closely examined in view of irreversibility of the human systems. It is proposed that the Jain concept of evolution of consciousness might be closely related with some kind of order at different levels.

The importance of consciousness is explained using an example through extraordinary memory of Swamy Vivekananda and two examples of satavdhanies who have amazing mental capabilities. An evidence is also given to mention that ancient Indians through this knowledge of consciousness might have even tried to estimate the size of the smallest particles of matter, This may inspire the scientific community to take up the concept of consciousness in a serious way, because its evolution might be directly lead to new concepts of even development. It is also illustrated that spiritual processes mentioned in Jain philosophy could provide new direction for development and concepts of knowledge and evolution which may be accompanied by a reduction in entropy production in the brain as well as in the society and the atmosphere at different levels (Pokharna 2012).

Not only this, the role of consciousness and thought processes isalso elaborated by David Bohm (1951). His concept of the implicate order and explicate order provides a new way of looking at the world. Also we should emphasize that the process based thinking and interconnectedness of various components of nature is most essential to understand the modern problems in a systematic way. Hence Jain philosophy needs to be reexamined in the modern perspective.

Section 2 briefly summarized the consequences of scientific, technical and economic development in producing entropy production in the world. Section 3 illustrates the limitations of scientific methodology due to conservation laws. Section 4 highlights further limitations of scientific methodologies in handling any system and mention the Godel's incompleteness theorems which describe such approaches and hence a need to develop an abstract concept of consciousness. Section 5 and 6 elaborates limitations of science as applied to living systems and need to use General Systems Theory. Section 7 explains that there is a need for a concept of consciousness and its evolution in the modern science if we look at these issues in a systems perspective. This section deals with the possibility of knowledge through consciousness as mentioned in Indian philosophies and recognized by many

scientists. Section 8 discusses the concept of consciousness and knowledge through consciousness in Jain philosophy. In section 9, it is mentioned that we must treat scientific knowledge as a sub set of total knowledge which can be perceieved through the consciousness. Section 10 gives an example of spiritual order with a quantitative evidence about sharp memory of SwamyVivekanand with a suggestion that the scientific community should take the concept of consciousness very seriously. Two examples of satavdhanies are also given which clearly illustrates higher stages of consciousness which may involve extraordinary capability of the human mind and consciousness. An example is also given which shows that ancient Jain acharyas might have directly perceived the smallest particle of matter and even tried to estimate their size. In section 11, a hypothesis is put forward that spiritual processes may be defined as that set of processes in which rate of entropy production and total entropy decreases and is accompanied by the emergence of a new type of order. In section 12, some examples of order are given. Whereas section 13 mentions some examples of processes through which entropy is reduced and order is generated among Jain's monks. In section 14, we discuss the Darwin's principle of evolution expressed through the famous expression of "Survival of the fittest" and attempt to compare it with the spiritual evolution described through the principle of "Live and Let Live". These two principles will have a totally different impact on the definition of the concept of development. Section 15 discusses the impact of too much education of Darwin's principle of evolution on human life. In section 16, the Jain's concept of evolution of consciousness is mentioned in summary form. We then compare Darwin's principle of evolution with the Jain principle of evolution in greater details in section 17. The conclusion is given in section 18.

2. Science, Technology, Economic development and Entropy:

In this section we shall see how a unidirectional concept of Economic development and its modifications due to science and technology have destroyed the environment and is degrading the life support system irreparably. Actually economic development is required for smooth running of a society and everybody wants it. However, with the advancements of science and technology, a huge industrial revolution took place in the whole world. Due to this economic activity started concentrating ina few places and in a few cities. Their activities started polluting the natural resources in a highly damaging way. The whole process of polluting the environment can be traced to these increased industrial activities and increase in population due to decrease in the death rates. Due to the congestion of the cities, their results a cut throat competition among people for survival. The old value system based on simplicity, honesty and sincerity started getting replaced by complexity, consumerism, dishonesty, and unwanted domination of certain groups and countries over others. It has also resulted in a large scale corruption in many places in the world. The emphasis on economic development has become so much so that all other types of developments have been set aside. Thus women in many

countries who used to work towards spiritual evolution, religious activities and family welfare, have all started working for economic development only. Also indices based on economic growth are so much dominating the people's mind that the impact of economic development on the environment is totally ignored.

Effectively one can say that final consequences of these activities have resulted in a very large increase in the entropy (disorder) of the environment and the society. Here entropy is to be understood in terms of mixing of objects and/or entities with time which results into more information to know these objects and/or entities. Some examples are given below where one finds the ideas of entropy increase in one way or the other.

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

Creation of the so called ordered systems (say concrete jungles, industries etc.) in the name of economic development have basically led to the generation of entropy in the biosphere. Such ordered systems can be called as "Ordered material systems" generating large entropy.

Now to understand the root cause of these problems, one has to closely examine the basic laws of science and find out whether this type of analysis can provide better alternatives and new directions of knowledge, order development and evolution.

3. Limitations of scientific methodology due to conservation laws:

Any phenomenon is called scientific if it can be verified in a laboratory under a given set of controlled conditions and is reproducible at any point of time and at any place. This condition is called space-time invariance condition in science. In addition, we define conservation laws of physics which are the foundation of all scientific measurements. Thus we have conservation laws for energy, linear momentum, angular momentum etc. Now all these conservation laws are defined for isolated closed systems, thus approximating the nature. Thus energy is defined as that variable of a closed isolated system which does not change over time (Landau and Liftshitz, 1964). But in principle we can never have a totally closed isolated system. Similarly linear momentum is defined as that property of a closed isolated system which remain invariant with any spatial displacement and so on. Hence the mere definitions of conservation laws are not perfect because they first divide the world and then try to define it. The interaction among these systems are then studied by considering the nature and magnitude of the interaction among them. For biological systems which are so strongly interacting with each other, this type of formalism cannot be applied in a satisfactory way in a real sense. Here order and organization are as much important as the individual components.

4. Godel's incompleteness theorems:

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

4.1. Gödel's first incompleteness theorem

This theorem says that the truth of a formalism (which describes any phenomenon) cannot be proved. Thus no finite expression of mathematical knowledge can ever provide a basis for comprehensive knowledge even of the elementary properties of the counting numbers. Thus if one starts with a collection C of symbolic mathematical (or any other) axioms which isspecifiable 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 axioms C, using the standard rules of mathematical logic. The proof of this theorem shows that from C one can

construct a sentence S in the simple mathematical language of elementary numbertheory 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.

4.2. Gödel's second incompleteness theorem

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

In these examples, Godel's theorems are applied to some cases in abstract mathematics, but they are now being explored in various other branches of sciences. However, as discussed above, a concept of consciousness is required to go beyond the current scientific thinking.

5. Limitations of the physical sciences as they apply to living systems:

Actually all living beings are essentially irreversible in nature, that is they grow and decay and they are also open systems compared to the physical system's which are closed systems. They constantly interact with the environment like, human beings take oxygen from atmosphere and releases carbon di-oxide. Hence biological and social systems cannot be subjected to the process of measurement and hence they are not exactly describable in the strict terminology of the physical, sciences, in addition, human systems have a memory which makes it impossible to do any scientific experimentation on them. Hence such systems are studied in a different way by using statistical procedures. In such methods only some rough trends or patterns can be found.

Now this type of experimentation is not possible in case of present phenomena because as shown above human system has memory, free will, creativity, tendency to interact strongly with other fellow beings and the environment. Furthermore there are micro controls in the form of thought processes which cannot be easily adjusted in any planned "scientific experiment". Hence it is impossible to perform experiments on human systems and predicting events about them from a purely scientific point of view.

6. General Systems Theory and its implications:

Hence to handle the problems mentioned above, we look for a new discipline which has recently emerged (John Gigch, 1978) and is called General Systems Theory (GST). It has been developed to handle such complex systems and issues. Different sets of rules are there to describe and understand such systems (Table 1).

Table 1.

A COMPARISON OF ASSUMPTIONS UNDERLYING SYSTEMS TO WHICH THE ANALYTICAL MECHANISTIC APPLY WITH ASSUMPTIONS OF SYSTEMS TO WHICH GENERAL SYSTEMS THEORY APPLIES		
Properties of Systems	Assumptions of systems to which analytical-mechanistic approaches apply	Assumptions of systems to which general systems theory applies
Living or nonliving	Nonliving systems	Living systems
Closed or open	Closed; with feedback: Limited properties of open systems	Open
Separability	Wholes can be broken down into component parts	Wholes are irreducible
Aggregativeness	The whole is a sum of the parts	Whole can be more than the sum of parts
Interdependence	Low interdependence parts can be treated in isolation	High interdependence: parts cannot be treated in isolation
Complexity	Organized simplicity: unorganized complexity	Organized complexity
Central concepts	Force and energy	Entropy and amount of information, in the theory of Information sense
Entropy and order	Equilibrium: maximum disorder	Systems resist the trend toward disorder by: 1. Importing energy from environment 2. Processing information
Purpose and teleological implications	Antecedents are of interest(causality)	The consequences are of interest (Goal- directed systems)
Organization and hierarchy	Properties at higher systems levels inferred from those at lower systems levels	Properties of organizations cannot be inferred from those of component subsystems.

This concept takes into account both physical systems and biological and social systems. Actually system's properties depend on their domain. The domain of systems is the field over

which they extend. It can be classified as to whether: (a) Systems are living or nonliving, (b) Systems are abstract or concrete, (c) Systems are open or closed, (d) Systems exhibit a high or low degree of entropy or disorder, (e) Systems display organized simplicity, unorganized complexity or organized complexity, (f) Systems can be ascribed a purpose or not, (g) Feedback exist or not, (h) Systems are ordered in hierarchies and/or Systems are organized, (i) System and associated processes are reversible or irreversible and so on. (See Table below from Gigch 1978 and Pokharna 2010 for details)

In this analysis pure physical sciences are now categorized as hard systems and subjects like sociology, religion, psychology, biology etc. are classified as soft systems. (Bertalanffy 1976). It has been developed to handle such diverse systems and is a serious attempt to reconcile physical sciences with social sciences. As per this theory, all systems are characterized by the transfer of information, knowledge and entropy/order which are much more important than any other attribute. Even energy comes next to them.

Hence even religion also falls in this domain, as some type of system in which, there is information and knowledge transfer going on continuously. Actually the physical systems like physics, chemistry and mathematics are called “Hard systems”, whereas social systems such as sociology, biology, religion, political science and economics are called “Soft systems”. Thus religion and science can be reconciled in this formalism.

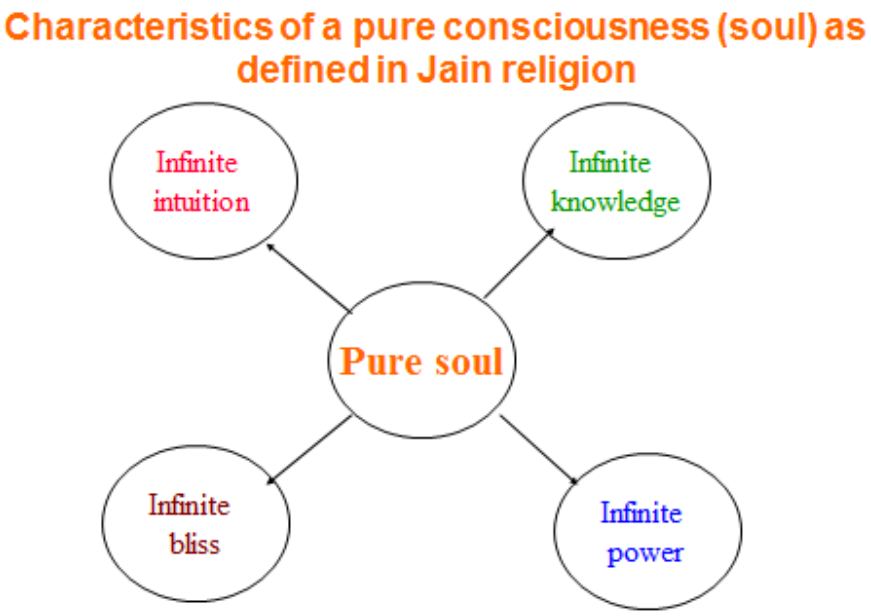
7. Consciousness and its evolution should be a fundamental element of any new paradigm of total systems approach to deal with the modern problems:

As order seems to be the most critical factor in the process of development and also order in the brain is most critical which will influence all other types of orders, it is necessary to understand this order and its relation with knowledge and consciousness. Also since knowledge is another crucial concept associated with brain or consciousness, it is equally important to understand the concept of knowledge associated with brain and consciousness. Actually the concept of consciousness is described in biology, psychology, neurobiology and quantum mechanics also. Asimov, (1990) has argued that consciousness will be one of the three subjects on which research will be done in 21st centaury, other two being environment and astronomy. Philosophically, several Indian schools of thought also talk about consciousness and its evolution. They basically assume that knowledge is structured in the consciousness. Several experimental studies have been carried out to recognize various states of consciousness like sleeping. Waking and dreaming stages. A fourth state of consciousness is well established now (Transcendental Meditation). Many more such studies are required in this direction as Indian yogis and monks talk of several higher stages of consciousness. Also one finds that in Indian context this evolution of consciousness is closely related with

practices which are carried out while living with nature and hence persons deeply involved in such pursuits are very close to nature, so they are strongly helping in preserving the environment (Maharishi Arbindo 2011). This must be recognized in view of the serious threat to the environment caused by uncontrolled materialistic developments. Such ideas of spiritual evolution should be also examined while talking about development. A lot of progress has been recently made in the field of neurosciences for searching and understanding the concept of consciousness. A concept of quantum consciousness has also come into existence where attempts are being made to explore the quantum theory in the field of neurophysiology to understand the concept of consciousness. See the Appendix 7 for a brief description. It appears that GST and Jainism can help a lot in further clarifying the concept of consciousness and the soul. This grant unification requires further exploration.

8. Concept of consciousness and knowledge in Jainism:

Let us now look at the concept of knowledge in Jainism. In Jainism, the world is assumed to be consisting of six elements. They are: Dharmastikay (Medium of motion), Adharmastikaya (Medium of rest), Akashastikaya (Space), Pudgalastikaya (Matter), Jeevastikaya (Living beings having a soul) and Kala (Time). Jainism has defined the soul as the basic constituents of all living beings. According to the conception of Jainism, a perfect soul has infinite knowledge, infinite intuition, infinite bliss and infinite power. Although perfect soul has other characteristics but the knowledge has been regarded as the chief characteristic of soul. Kundakunda (Mehta 1980) has stated that although from the empirical point of view there is a difference between the soul and knowledge yet from the transcendental point of view it is sufficient to say that the soul is knower and nothing else. He further said that there is no difference between the knower and his knowledge. From an empirical point of view an omniscient (Kevali i.e. a perfect soul) perceives and knows the whole of reality and from the transcendental point of view he perceives and knows nothing. Therefore what we call as scientific knowledge appears to be just a subset of this grand concept of knowledge, which can exist in the human consciousness.



Five types of knowledge are defined in Jainism (Table 2) . They are:

1. Mati Jnana (Knowledge acquired through one's own mind that is without anybody's help,
2. Shruta Jnana (Knowledge acquired through listening, reading books and observing others),
3. Avadhi Jnana (Telepathy),
4. Manahparyaya Jnana (Clairvoyance) and
5. Keval Jnana (Absolute knowledge).

They are further divided into several categories as shown in the Table 2.

Table 2. Categories of knowledge and their sub-classification in Jainism

SN	Type of knowledge	Sub classes
1	Mati Jnana (knowledge acquired through one's own mind	340 and 28 in two different ways
2	Shruta Jnana (knowledge acquired through external sources)	18 and 20 in two different ways
3	Avadhi Jnana (Telepathy)	6
4	Manha Paryaya Jnana (Clairvoance)	**2**
5	Keval Jnana (Absolute knowledge)	**1**

All species may be physically different but are existing in the world from the past which does not have any beginning. It is due to their attachment with material particles known as karma that they continuously take birth in the world again and again.The direction of evolution should be towards a goal of liberalizing the soul from all material attachment that is all karmas. A process of selection by oneself is involved in spiritual evolution as certain rules

and principles have to be followed described separately for ordinary humans and for enlightened souls like acharyas and sadhu sadhvies etc. It appears that practices like chanting of mantras, doing mediation (samayik), fasts (upwas, aaymbil, varshi tap, mas khaman, updhan, siddhi tap, nanayanuyatras), and other several practices lead to very stable life, increasedin self-confidence, recognition of inner strength of soul, and ultimately evolution of one's soul. This is a selective type of process such that it depends more on oneself and is not much affected by other species or human beings present in the environment. It is preached that one should reduce one's requirements in such a way that even if there is scarcity of resources, lower consumption will guarantee survival of all in a cooperative way. A state of highest orderliness is defined as a pure soul, towards which, everyone has to evolve. This is compatible with GST where definite goals are defined.

9. Need to realize that scientific knowledge is only a subset of the total knowledge system and actual Knowledge is structured in the consciousness:

With the advent of science and the resulting technology, a misunderstanding and misconception has developed among the masses that the scientific knowledge is the only ultimate knowledge in the world. Not only this, it also presumed that the knowledge which is experimentally verifiable and repeatable at any place and at any time alone is the actual knowledge. This is far from the truth. The fact is that the so called science is just around 200 years old and the concept of knowledge existed much before that for several centuries. Vedas, Upnishads, Puranas, Agamas, Mahabharat and Ramayana, Koran, Bible have lot of knowledge about life and controls to be followed. Similarly technology of gold manufacturing in the ancient India, design of old temples etc. involves knowledge, which need not be scientific.

Actually the recent developments in computer science and neurobiology clearly show that knowledge is nothing but information organized in some way (Goldsmith 1990). And in turn, information is just organization of data in some fashion. It is also realized that human consciousness (and even animal consciousness) is capable of organizing these data and can generate information and hence knowledge in some way. Therefore what we call as scientific knowledge is just a subset of this grand concept of knowledge, which can exist in the human consciousness. Because all interpretations of all scientific experiments are ultimately done by human consciousness.

10. Three examples which show that concept of knowledge through consciousness and orderliness should be seriously studied in a modern perspective:

We now give three good evidences which show that there is a need to take the concept of knowledge through consciousness in a very serious way. These examples are given below:

10.1 Remarkable memory of SwamyVivekanand:

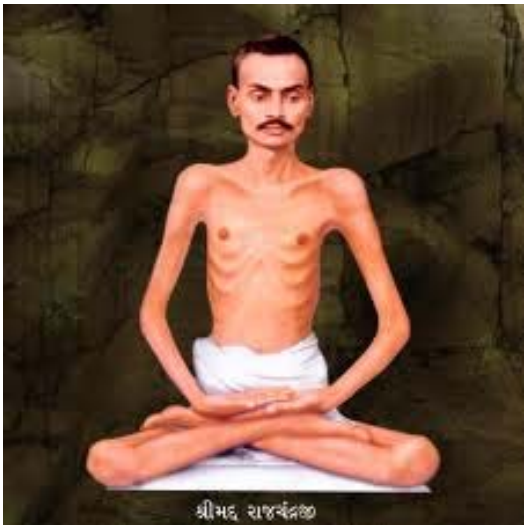
If we look at some meaning of the term consciousness in the scientific perspective than we find that it is a property of all biological systems. When our acharyas, rishies and munies talk of realization of a higher state of consciousness which has certain characteristics, then it is worth examining the following examples. The first concerns with extraordinary sharp memory of Swami Vivekanand (The Life of Swami Vivekanand, Vol II, pp. 634, AdvaitvaAshrama, 1989). As per this Swamiji had such a sharp memory that he almost remembered 11 volumes of Encyclopedia Britannica, which he had just read once. A question is to be raised by the scientific community, "what is the mechanism and how this state of orderliness is achieved and is related to his/her behavior as Yogi ?"

Swami Vivekanand

10.2 Shatavdhani: Demonstration of extraordinary capability of memory and ESP:

It is mentioned in section 7 that a perfect consciousness with the four infinities perceives everything of the universe simultaneously and completely by a single cognition. However, a worldly soul (an enlightened soul but not yet perfect) can also have rich knowledge contents due to spiritual growth and religious practices. One example of this hypothesis is given below which is called shatavadhan. Shatavadhan (Shat- 100 + Avdhan) is a power to cover 100 different activities in a single act of attention. One who reaches the stage of shatavadhan is called Shatavadhani. A shatavadhani.can remember 100 different things in a 100 different

orders, spoken by 100 different people. This unbelievable power has been attained by a handful of people over the human history and because it occurs during a very high stage of spiritual development. This is possible only when one is able to have self-control in order to experience the power of the soul. According to the modern scientific belief, a normal human being utilizes hardly 2% to 3% of his total mental potential. A common man can hear and remember serially 3 or 4 at a time. This is based on the conscious mind. Anyone with exceptional intellect can extend this number from 3-4 to 10-11. However, taking this number to 100 is beyond the powers of most of the people. Shatavadhan is the ability to receive, retain and retain 100 activities accrued through the eyes or ear during one period of attention and carried from the conscious to the subconscious. A Shatavdhani can utilize a maximum of mental potential which demands immense concentration. That is the reason that history can name only countable shatavdhanis .



Shrimad Rajchandji, teacher of Mahatma Gandhi

In Jain tradition one can name Shrimad Rajchandra, Guru of Mahatma Gandhi (KalarthyMukul, 2004) from whom he learned the concept of ahimsa (non-violence). Shrimad exhibited his mnemonic powers in late 19th Century in Mumbai. Gandhiji had a great impact of Shrimad of his religious beliefs. This is also narrated in his autobiography (Gandhi Mohan Das 1990)

After one hundred and twenty five years of performance of the shrimadraj Chandra at the age of 19, another shatavdhani is creating history, again in the same age range. This great young shatavdhani is respected young shatavdhaniMuniShriAjitchandrasagarjiMaharajsahebji. He can reproduce not only 100 facts but 108 facts in ascending, descending and random order. The details of questions are given in the appendix 1. This demonstration was done twice in Ahmadabad (Nov 16, 2008 and January 9, 2009). The former was held in the Town Hall and author was present there. Recently on March 4, 2012, he gave a demonstration of 200

questions, situations and events in Shan Mukhanand Hall in Mumbai (and again the author was present there) in presence of around 5000 persons. It was a mind boggling experience for a scientific mind. This monk was just 19 years old (in 2008) and is a strictly following celibacy and has not spoken from last few years. Now he is around 24 years old.

Ajitchandrasagarji performs Shatavdhan at town hall

Young muni displays yogic memory power

Kintu Pushpa Gadhvi

Everyone was awestruck in the hall as a 19-year-old Jain muni performs a unique experiment in the presence of more that a thousand present there. As everyone was overwhelmed with the proceedings, Ajitchandrasagarji performed Shatavdhan with his characteristic aplomb. The muni was performing the Jain tradition of remembering 100 queries from people and later giving their replies in detail. The event was held at the town hall on Sunday.

Shatavdhan means 'hundred means to remember'. It is based on a yogic kriya of maximum utilisation of the subconscious mind and can be performed only when the yogi is in complete peace and in full concentration. Ajitchandrasagarji, who took diksha at the age of 12, can easily recall all the hundred statements, which were posed by the people.

He can recall them in sequence both in ascending as well as in descending orders. During the experiment of Shatavdhan, he listened with rapt attention all the statements and after completion of 100 statements, he recalled every statement without any pause.

Some of the statements put forward during the experiment were very long and complex. Like questions from 95 to 100 were about Jain chants from Agamas. Many Jain munis give the reference in just one word but Ajitchandrasagarji spoke in detail on the subject.

Speaking on the occasion, noted scholar Prof Kumarpal Desai stressed on austerity in life. "When our souls are in peace, natural power comes into force. At the age of 10, Ajay (Ajitchandrasagarji's name before diksha) was in a vihar in the service of Jain sadhus. Ajitchandrasagarji has the ability to memorise 200 statements and thousands of slokas. He can recall them even after six months."

His strength

Ajitchandrasagarji can easily recall all the hundred statements, which were posed by the people. He can recall them in ascending as well as descending order

Shri Ajeet Chandji Maharasahab

The procedure adopted by Shrimadji in giving these demonstrations of his rare powers was indeed most exacting. In one demonstration, he could carry out fifty two activities in a sequence (Appendix 2). He would begin all the fifty-two activities at once, simultaneously. He would attend to a portion of each task at a time. He will then attend another second task, next move on to yet another third task, fourth task, and so on. After some time, he would return to the first task. He would cover these rounds, one after the other, until he had covered all the fifty- two task. He made it a rule not to put down any points on paper while attending to these various activities, nor to take any notes and to ask anyone to repeat anything.

In Samvant 1943 (1887 AD), Shrimadji reached the peak of his achievements in this direction. He was Mumbai at the time. There he gave a demonstration of his powers for simultaneous mental attention, this time covering a hundred different activities. He gave these demonstrations at centers including Faramjee Cowslip Institution at Dhobi Talao in Mumbai. The demonstration of powers to attend to a hundred different activities simultaneously earned him a tremendous amount of admiration all around. People were profoundly impressed by his extraordinary mental powers. (Author could not get the list of these hundred activities).

10.3 Did ancient Jain Acharyas tried to estimate size of smallest particles of matter:

Another example is taken from ancient Jain scriptures (TriloyPannati, Jain RC. 1975). Appendix 3 gives a Table for measurement of length. It starts from the smallest particle of matter and goes up to one Yojana (a commonly used unit of length prevalent in India even now. This is an octal system till step 12. It indicates that ancient Jain acharyas have made an attempt to develop a table for measurement of length in 20 steps. As explained in the Appendix, if we statistically interpret it then we find that as per their assessment, the size of the smallest particle of matter is $2.9X\ 10^{-11}$ cm. Hence the size of the smallest particle of matter that is avsannasannaskandha is around $2.9\ X\ 10^{-11}$ cm. This value lies in between the size of a modern atom (10-8 cm) and size of a nucleus
(10^{-13} cm). Now we may not be knowing the meanings of many of the objects used in this Table. But statistically, this is a very significant observation and should be taken quite seriously by the scientists. At least it cannot be ignored. The mere fact that it was arrived at from the telepathy of advance level through which one can see even the smallest particle of space known as a pradesha in Jainsim, should be a very exciting observations. This again shows that the Jain concept of knowledge should be taken very seriously by the scientific community and should be further explored in a careful way.

Now the mere fact that this concept might have evolved through a realization of this higher level of consciousness is worth examining. It appears to involve advanced telepathy (known as avadhijnana in Jainism) or some type of advanced knowledge. An acharya who is having this capability must have brain in a very high state of order.

11. Do spiritual processes help to reduce Entropy Production and resource consumption in the biosphere:

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

consciousness. Therefore there is a need to investigate the different states of human consciousness which can be in highly ordered states as mentioned in the above sections.

12. Some examples of Order in nature:

Now let us understand what we mean by order in the present context. The following examples attempt to illustrate our point of view.

a. Climatological order through precise movement of the Earth around Sun and the Moon around the Earth along with proper mix of various gases in atmosphere with a narrow temperature range etc.
b. Three and up to six seasons on various parts of the Earth, which occur in the periodic way.
c. Agricultural order like crop cycles and their dependence on weather etc.
d. Various cyclic processes in many biological systems including human systems.
e. Self-organized structures in brain and our body.
f. Maintenance of economic order in world economy.
g. Order in a laser beam
h. Order in the life supporting systems, (which could be some combination some of the of the above) and others

Figure shows a set of concentric circles. Each circle represents one cylic process, say motion of electron around proton. Other circles represents other cyclic processes in nature like biological cycles, crop cycles and or planetary motions etc. They all put together imply some grand "order" in nature.

A very advanced concept of order known as Implicate order in quantum mechanics is also discussed in the Appendix 5 and may be very relevant in the present context as it could represent a pure soul of Jainism.

13. Methodology and mechanisms developed in Jainism to increase order and reduce entropy:

Five main principles of Jainism known as Mahavratas viz. Satya (truth speaking), Asteya (Not to do theft), Ahimsa (nonviolence), Brahamacharya (Celibacy) and Aprigraha (Minimizing materialistic possession) have been developed so as to have a discipline life during all stages of evolution. These are the principles to be followed strictly by monks, aacharyas and higher ups in the ladder of evolution. For ordinary human beings smaller vratas have been defined which are called Anuvratas. These are a simplification of the above rules meant to start the

process of evolution at a very stage. Thus twelve vratas (rules) are there to be followed by shravakas and shravikas (ordinary religious men and women). Even the process of evolution is described in details by defining association of a mundane soul with materialistic particles fromthe past. These particles are called karmas and are classified into eight categories. As one's soul evolves, the number of karmas decreases. It appears that the larger the number of karmas associated with a soul, larger will be the uncertainty and so larger will be the entropy. A full fledge system of Nava tatva (Nine elements) has been developed to explain the process of reducing the karmas from past and stopping inflow of new karmas. Several rules and practices have been developed to practically implement these vratas like different types of fasts (Ekasana= eating only once in a day, Aayambil= eating food once in a day without oil, sugar, salt etc, Upwas = Not to eat anything in a day, not to eat food for days together and their higher version (Mas khhaman, Farsi taps), and many different types of meditations. To distinguish true knowledge from false knowledge, a concept of three jewels is defined knows as samyagjnaja, samyakdarshan and samayakcharitra etc. Another important concept developed is of three yogas (Manha, Vachan and Kaya) and three karan that bad action should not be doneby oneself, should not get it done by others and should not support the other who is doing it. Several sub categories and concepts are given to handle this process in minutest possible details with very extensive description.

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

The above examples show that one should take this concept of evolution of consciousness of Jainism seriously. Hence at this juncture, it is high time that we discuss the process of evolution of soul as described in Jainism and compare it with the Darwin's principle of evolution.

As we know this principle is based on the rule of natural selection and was brought into limelight by Charles Darwin. An assumption is made that all life emerged from the slow evolution from a single ancestor. The basic idea of his hypothesis is that due to limitation of resources, various species of living world struggle for survival. Those which have slightly superior functionality will survive and others which do not have these additional functionalities will be eliminated and the whole process is very slow. Hence those who can adjust to the change in time, survivors and others are eliminated. This is therefore being described in short by a well know saying that is "the survival of the fittest. This principle was enunciated by Darwin about 150 years ago. At that time there was no genetics. With this new development, the same principle was termed as Neo Darwinism. Under this name natural selection at the genetic level is considered during mutation and those genes are selected which are superior in functionalities. (Wikipedia)

Darwin also talks aboutthe evolution of human beings and mammals and observes that all humans have striking similarities with apes and hence humans evolve from apes through natural selection in very slow processes over long time. However, Darwin's ideas are based on analysis of past data and develop correlations between them to establish some hypothesis. He observes that there are no goals or directions for species to evolve, say like for highly developed species like human beings and animals, which might be partly determined by a value system prevalent in the society. They only look at nearby future and attempts to survive. (Wikipedia).However, Darwin's ideas are based on analysis of past data and develop correlations between them to establish his hypothesis. His laws do not provide any goals or objectives and directions of development for the species. They only look at nearby future and attempts to survive. (Wikipedia).

On the other hand, the Jain's principle of evolution is characterized by the principle of "Live and Let Live" and it emphasizes on recognizing the underlying identity among all living beings.

15. The Darwin's principle of evolution and its impact on society and the environment:

At this juncture, it is also necessary to understand the important role of education of The Darwin's principle of evolution on the society and the environment. Goldsmith (1990) feels that it is due to too much emphasis on the education of this Darwin's principle of evolution that so much damage has been done to the environment. Dennet (1995) has written a book whose title puts Darwin's Dangerous Idea: Evolution and the Meanings of Life lot of emphasis on designing of morality, the risk involved with the Darwin's principle of evolution and its education. In view of this situation, there is a need to examine the Jain's principle of evolution of soul in some details.

16. The Jain concept of evolution of soul through fourteen stages and order:

The path of evolution of soul in Jainism is described through fourteen stages, through which one has to pass through before getting liberalized, that is becoming a pure soul from an impure soul which is associated with many material particles known as karmas. These fourteen stages or phases are called fourteen Gunasthanas (Pokharna 2012). They are (Table 3).

Table 3. Different stage of consciousness as discussed in Jainism

Number of stages	Name of stage	Degree of order
14	Ayogi kevali	Ultimately highest
13	Sayogi kevali	Highest
12	Kshina mohniya	Very Very high
11	Upshant mohniya	Very high
10	Sukshma Sampraya	High
09	Nivrati-Badar	Quite highly ordered
08	Apramat Sayant	Intermediately ordered
07	Pramat Sayant	Medium ordered
06	Virta virat (Deshvirati)	Some more order
05	Avirat Samyagya dristhi	Some order
04	Mithyatatva Dristhi (Mishra) Slightly ordered	
03	Samyagya	Low chaos
02	Sasvadan	Lowest chaos
01	Mithyatatva	Complete chaos

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

17. Comparison between the Darwin's principle of evolution and Jain's concept of evolution:

After defining two types of evolutions in details, we need to compare the two.

- Darwin's principle is based on an emphasis on differences among species. Jainism on the other hand first look at the underlying identity of all the species and claims that the soul is the underlying identity among all the biological species.

- Darwin's principle is based on the concept of natural selection that is species which are superior survives whereas those which are inferior with respect to adjustment to the environment and/or availability of resources die out or are eliminated. Jainism says that all living beings want to evolve and so highly developed species like human beings should support evolution of other species through the principle of non-violence (ahimsa). Thus Jains also talk of evolution, but it is spiritual, which is accompanied by an increase in purity of soul and increase in its knowledge content. In spiritual evolution also, one has to be very selective as a very strict discipline is demanded for oneself. A strict set of rules has to be followed to progress along the spiritual path. It is mostly concerned with internal processes and phenomena. However, in this process, they consume minimum resources and hence resources do not have great impact on survival. It is least important which is critical in case of Darwin's principle.

- It appears that the various principles and set of rules and regulations developed by ancient Jains are just like control parameters in this huge biosphere which indirectly provides stability of the biosphere on the long time scale and are hence critical conditions required for continuation of life processes on this planet. They also reflect the interdependence of various activities of human beings on different components of the biosphere through the principle of ahimsa.

- With the discovery of genes, mutation takes place in such a way that new genes are more robust and are transferred to the next generation. However, in Jainism, it is individual soul which leaves a body in one life and goes to another world after leaving the body in one life. As knowledge is the major characteristic of the soul, knowledge is carried over to the other birth (as soul never dies even when the body dies).

- Darwin's does not talk about any goal in the process of evolution , except for natural selection and the whole evolution could be a set of randomly occurring steps of evolution without following any direction to achieve any goal. Jainism on the other hand talks of Moksha or siddha Samadhi, which is the target or one's goal. Hence many uncertainties are reduced.

- Darwin's principle is around 150 years old whereas Jain's principle of evolution is at least 3000 years old and is still found very relevant in the modern time, hence more rigorous research is required in this direction in view.

- In view of the above principle of Jainism that worshipping of all animal kingdom and plant kingdoms and all natural objects like water, soil, air etc. is encouraged. Hence in Jainism, a concept of "Live and Let live" has evolved, indicating respect for all living beings and aims to define future goals of all living beings. On the other hand the Darwin's

principle of evolution, developed in the west is based on the concept of natural selection (now genetic based mutations etc.) and is expressed in the form of "survival of the fittest". This is totally opposite of the Jain principle of "Live and Let Live". These two opposite thoughts can be reconciled through one argument. It is this, that in the Jain system, the emphasis is on recognizing the underlying identity among all living beings (like a unified field theory) whereas in the case of Darwin's principle of "survival of the fittest" can be traced to an emphasis on the differences among the living beings.

– As concept of development is closely related with the concept of evolution present in a society and the goals of the society. Hence the concept of consumerism developed in the western world but in the Indian system, there is more emphasis on spiritual development which automatically reduces consumption of resources.

18. Conclusions

This paper attempts to explore the limitations of scientific methodologies found so successful to study physical systems and infer that are not adequate to understand biological and human systems. Hence a concept of General Systems Theory (GST) is required to develop a unified formalism which includes both physical and biological systems like social systems and human systems. Through this type of approach, even science and religion can be reconciled. It is mentioned that the concept of information and knowledge has to be also enlarged by taking the concept of knowledge through consciousness into account. We have to realize that all scientific knowledge is just a small set of knowledge structured in the consciousness. In particular it is shown that Jain's concept of knowledge through consciousness (soul) can be very useful to have an enlarged concept of knowledge, which can include extra sensory perception (ESP) also. It is shown that the Jain concept of evolution in which a soul become more and more pure and its knowledge contents increases, so it becomes more and more orderly. Hence it is argued that such processes of spiritual evolution may be accompanied by a decrease in rate of entropy production at different levels. Some examples of order are given like those of SwamyVivekanand to illustrate the meaning of this order. Two more examples from Jainism are given which show extraordinary states of mind in highly ordered states of satavdhanies. In another example, it is shown that ancient Jain Aacharyas might have even tried to estimate the sizes of the smallest particles of matter like atoms and nuclei through highly advanced telepathy. It shows the existence of telepathy of very high order.

It is also mentioned that the Jain principle of "Live and Let Live" should be compared with the Darwin's principle of evolution described by "Survival of the fittest". The difference between the two will have a totally different impact on the concept of development and the society in general and direction of evolution in particular. The Jain concept of evolution is

then mentioned to indicate that their concept of fourteen stages of evolution of the soul (Gunasthans) is a very exciting concept and needs further exploration

It is then mentioned that a new world view provided by the concept of the Implicate Order of quantum mechanics as enunciated by David Bohm is also relevant here and can provide an alternative view to look at the reality. This implicate order could be closely related with Jain's concept of Keval Jnana.

This is an exploratory study only and is an example of multidisciplinary work where many loosely defined terms are used. They need to be further explored.

19. Acknowledgement

I am extremely grateful to several Jain Acharyas whose preachings, Darshan and their lifestyles and blessings have highly motivated me to take up this type of work. The list is unending but some prominent ones are late Aacharyashri Ganesh Lalji Maharasa, Late Shri Nana LaljiMaharasa, Late Aacharya Shri Tulsi Maharasa, Aacharya Shri Mahapragnyaji, Aacharya Shri KanaknandjiMaharasa, Aacharya Shri Rajyash Surishwarji Maharasa, Prof. Maharasa, Aacharya ShriNandiGhosh Vijayji Maharasahab, Upacharya Shri Gyan Sagarji Maharasahab, Late Shri Mahesh Yogiji and many other Jain and Hindu Sadhuji and Sadhvijies who have been my inspiration.

I am very happy to thank Prof. H. Frohlich; F.R.S. (England), (who has referred some of the above work to Prof. B. D. Josephson, Noble Laureate), Prof. E. C. G. Sudarshan (Texas, USA), Late Prof Richard Feynman, (whose books on physics have helped me a lot in better understanding of the laws of nature). Prof. K. P. Sinha (Bangalore), Prof. C. L. Mehta (I.I.T. Delhi), Late Prof. D. S. Kothari (Delhi), Shri M V Murthy (Udaipur but currently in Bangalore) , Prof. Jatkar (Poona), Late Prof. E. P. Wigner, Late Prof DalsukhbhaiMalvaniyaSahab for interesting correspondence, discussion and sending highly critical comments with appreciation about some of the above work. I am also thankful to Late Dr. U. N. Upadhyay, Dr. K. C. Sogani, Dr. L. K. Kothari, Prof. Narendra Bhandari, Prof. Rajmal Jain, Shri Jitendra Shah, Dr. Sudhir Shah, Shri Sanjeev Sogani, Dr. N L Kachhara, Late Shri H. S. Sarupria, Shri F. C. Mehta and Shri D. L. Mehta for their keen interest in this work. However, this work was possible only because of sanskars which I got from my parents Shriman Balwant Singhji Sahab Pokharna, my Baiji Shrimati Lehar Kunwar Pokharna, my grandmother Shrimati Bhur Baiji Pokharna, my Bhuwasa Shrimati Mohan Deviji Chowdhry, Phuphasa Shriman Daulat Singhjji Chowdhry, my elder brother Shri Jagat Singhji Pokharna, Late Shri Paras Mulji Ostwal, Shri Prem Chandji Ostwal, my wife Sunanda Pokharna and several relatives and friends.

20. References

- Aacharya Shri Nanesh (Nana Lalji Maharasahab), 2008, Jin Dhammo, Akhil Bhartiya
- Sadhumargi Jain Shravak Sangh, Bikaner, 202-209. (In Hindi)
- Bertalanffy, Ludwig Von General Systems Theory, Foundation,Development, and Applications, Amazon Publishers, 1976
- Bohm, D "Wholeness and the Implicate Order" by Rontledge&Kegan Paul, London, 1980.
- Brudy Rocker, "Infinity and the Mind: The Science and Philosophy of Infinite", Bantam, New Age Books for Gödel's theorems and Consciousness etc. 1983.
- David, Bohm, Quantum theory, Prentice Hall (1951).
- Daniel Dennett (1995) Darwin's Dangerous Idea: Evolution and the Meanings of Life, Simon and Schuster.
- Gandhi Mohan Das (1990) My Experiments with Truth, Navjeevan Press, Ahmedabad, Gujarat, India.
- Goldsmith, E., "Evolution, Neo-Darwan-ism and the Paradigm of Science" in TheEcologist, Vol 20, No.2, p.67, 1990.
- Gupta R C , Indian Journal of History of Science, Vol. 10, No. 1, 38 (1975).
- Henry Margenu, D. Reidel, Physics and Philosophy, Selected essays, 1978
- Jain G R Cosmology old and new.
- Jantsch, E. (1980) The self-organizing universe, Pergamon Press.
- Josephson BD and Rubik Beverly (1992) The challenge of consciousness research, Athens Symposium on Science and Consciousness (Google)
- "Jyot", an exhibition about various types of knowledge systems (Including ESP) in Jainism, organized under the direction of Aacharya Yug Bhushanji Maharasahab in Ahmedabd (December 5-15, 2009).
- KalarthyMukul, ShrimadRajchandra, A Biography, Abridged, Book-I,Translated by Digish Mehta, ShrimadRajchandra Ashram, Agas (page 19), 2004
- Landau L D and Lifshitz (1964), Quantum Mechanics (Non-Relativistic Theory), Pergamon Press, Oxford, 1964, pp. 28 for definition of energy and pp. 42 for definition of momentum in QM.
- Mahapragnyaji (2012) Relative Economics, The New concept of balanced development, International Research Institute of Relative Economics, Ahimsa Bhawan, Jain Vishwa Bharti, Ladnu, 341306 (Rajasthan), India.
- Mehta M L, Outlines of Jain Philosophy, Mission Society, Bangalore.
- Penrose R, Emperor's New Mind: Concerning Computers, Minds and the Laws ofPhysics, London, Vintage, (1990).
- Pokharna Surendra Singh (1977) The convergence of the modern science toward Jainism, Sambodhi, 6, 1977, 15, LD Institute of Indology.

- Pokharna, S S (1985), "A systems approach in parapsychology, (Procd. of theInternational conference on parapsychology, held at the Andhra University,Vishakapatnam, India, Jan. 6-8, 1985.
- Pokharna S S (1985), A new investigation into the problem of perfect determinism in modern science- Indian Philosophical Quarterly, Vol. XII, No. 1,Jan. 1985.
- Pokharna Surendra Singh (1987) Some fundamental problems of biology, sociology,psychology, parapsychology, religion and spirituality : a systems approach- The Vedic Path, Quarterly. Journal,: Vedic Indo, & Science and Research, Volume L,1, June 1987.
- Pokharna S S (1988) ESP in het Jainisme, (De visie van een naturkundige), tijdschrift voor parapsychology (in Dutch language), Jaargang 56-Oktober 1988, pp 11-25.
- Pokharna S S (1991) Understanding the problem of conservation of natural resources and the environment from first principle: Extension of General Systems Theory is required in many areas, Presented at a 2 days conference on Dynamic Systems and Control held at, Indian Institute of Management, Ahmedabad (Nov.28-29, 1991).
- Pokharna S S (1995) Environmental issues and sustainable development: Need to study the human-environment interaction using General Systems Theory, presented in the UN sponsored Inter. Conf. on Environment, Sustainable Development and Human health, being organized by the Banaras Hindu University, Banaras (Feb 11-15, 1995)
  Pokharna Surendra Singh (2006), Science and spirituality, Proc. Of a Two day seminarheld at Kurushektra University, Kurushektra (India) Nov 4-5, 2006
- Pokharna Surendra Singh (2008), Science Technology and new paradigm of Philosophy: Modern interpretation of Jain Philosophy (in four parts)– Tirthankar Vani, published from Ahmedabad, Vol 08, pp.53-58 (May 2008), Vol 9, pp. 59-62 (June 2008), Vol 10, pp 59-61 (July 2008) and Vol 11-12, pp.73-75, Aug-Sept 2008.
- Pokharna Surendra Singh (2010) Limitations of Scientific knowledge and the concept of knowledge through consciousness in Jain philosophy. See abstracts and paper in Proc. Three day conference onScientific Development and our Responsibility, organized by the Gyan Sagar Science Foundation, New Delhi and held in Bangalore, Jan 29-31 (2010). Published in Journal of Gyan Sagar Science Foundation, Vol. , Issue 1, pp. 24-33, April 1, 2013.
- Pokharna Surendra Singh (2011), Need to Explore General Systems Theory and Quantum Mechanics for Better Understanding of Human-Agriculture-Climatic interaction and Agricultural Order, in Souvenir & Abstracts of National Workshop on Stress Agriculture and climate change: Exploring the synergy with natural resources management in agriculture (NaRMA-III) organized by PROM society Udaipur and RAU Bikaner, pp. 54-55 (Dec 21-22, 2011)
- Pokharna Surendra Singh (2012a) Knowledge, Order and Evolution,See abstracts in Proc. Of Two day conference onScientific Development and our Responsibility, organized by

the GyanSagar Science Foundation, New Delhi and held in Mumbai, Jan 7-8 (2012). Published in Journal of Gyan Sagar Science Foundation, Vol. , Issue 1, pp. 69-79, April 1, 2013.

- Pokharna Surendra Singh (2012b) Power of mind, Extra Sensory Perception and Remote Sensing: Need to explore possibilities of new frontiers of knowledge and new concepts, Signature, (A quarterly newsletter of Indian Society of Remote Sensing, Ahmedabad Chapter, January-March 2012, pp. 100-106.
- Pokharna Surendra Singh (2012c) Knowledge of Science and Human Consciousness, DNA (Ahmedabad Edition, April 5, 2012), pp. 4, Ahmadabad
- Pokharna Surendra Singh (2012d) Limitations of Scientific knowledge and the concept of knowledge through consciousness in Indian philosophy, Presented at 10th International Conference, organized by the World Association for Vedic Studies (WAVES, 2012) and held at the University of Massachuetts, Dartmouth (July 13-15), In press.
- Pokharna Surendra Singh (2012e) Exploration of General Systems Theory and JainPhilosophy Could Provide New Ways of Looking atthe Field of Bioethics, The Journal of Inter Religious Dialogue (JIRD), Issue 12, Spring 2013. Also see in The 2012 Clairmont International Jain Conference on Bioethics: Religious and Spiritual Approches, held at the Clairmont Lincoln University, August 24-25, 201, presented 2 through Video conferencing. See link. www.Clairmont_Aug\Surendra Singh Pokharna Jain Studies – Claremont Lincoln University.mht
- Prigogine, Ilya; Nicolis, G. (1977). *Self-Organization in Non-Equilibrium Systems*. Wiley.
- Prigogine, Ilya (1997). *End of Certainty*. The Free Press.
- Quantum consciousness (2013) http://www.scaruffi.com/science/qc.html
- Sri Aurobindo (2011), The Divine life upon Earth: The Future Evolution of Man, Selection from the works of Sri Aurobindo, compiled with a summary and notes by P BSaint-Hilaire, Sri AurobindoAashram Press, Pondicherry (India)
- The Life of Swami Vivekanand (1989), by His Eastern and Western Disciples, Vol II, pp. 633-634, Advaitva Ashrama, 5, Entally Road, Calcutta 700 014.
- Wigner E P, (1964) Proc. Of International School of Physics, “Enrico Fermi”, pp. 29, Academic Press, London. (For need of consciousness in science).

Appendix 1

Jainism , traditionally known as Jaina Dharma is an Indian religion that prescribes a path of non-violence towards all living beings and emphasizes spiritual independence and equality between all forms of life. The essence of Jainism is concern for the welfare of every being in the universe. Practitioners believe that non-violence and self-control are the means by which they can obtain liberation. Currently, Jainism is divided into two major sects-- Digambara and Śvētāmbara.

Jains believe in the notion that truth and reality are perceived differently from diverse points of view. This doctrine is formally called *anekantavada*. According to it, human beings are limited in their perception and knowledge about the reality. They can thus have only partial information. Philosophical and theological disputes arise only because of the partial knowledge of human beings. The Jain doctrine stresses on the existence of soul. According to Jainism, every living being is a soul and have a separate existence from the body that houses it. This soul undergoes a cycle of reincarnations. Jainism postulates the existence of fine particles of matter called *karma*. These karmic particle sticks to the soul on account of the soul's interaction with the karmas and it is through this karmathatthe soul is reincarnated and feels pleasure and pain.

The word Jainism is derived from a Sanskrit verb *Ji* which means *to conquer*. It refers to a battle with the passions and bodily pleasures that the *Jaina* ascetics undertake. Those who win this battle are termed as *Jina* (conqueror). The term *Jaina* is thus used to refer to laymen and ascetics of this tradition alike.

Jainism is one of the oldest religions in the world. Jains traditionally trace their history through a succession of twenty-four propagators of their faith known as *tirthankara* with Ādinātha as the first *tirthankara* and Mahāvīra as the last. For long periods of time Jainism was the state religion of Indian kingdoms and widely adopted in the Indian subcontinent.

Appendix 2. List of Activities that could be carried by ShriRaichandji one after the other without using any pen or paper

1.	To play the game of chopat, a kind of checkerboard, with three different players	1
2.	To play cards with three different persons	1
3.	To play chess with one person	1
4.	To keep a tally of the chimes of a Zalar a small gong	1
5.	To Keep computing sums mentally invoking addition, Subtraction, multiplication and division	4
6.	To count the beads on a thread	1
7.	To compose verses on sixteen diverse topics selected afresh, and in metrical forms chosen by various referees	16
8.	To answer about eight new riddles	8
9.	To recall four hundred words given at random from languages including Greek, English, Sanskrit, Arabic, Latin, Urdu, Gujarati, Marathi, Bengali, rearranging them in proper order such as subject, object etc. all the while attending to various other matters	16
10.	To explain certain things to a student	1
11.	Commentary on certain items of figures of speech	2
	Total activities	52

Appendix 3. Details of one hundred questions answered in the same sequence by Shri Ajeet Chandra SagarjiMaharasahab.

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

Appendix 4. Table of Measurement of Length as Found in the JainaLiteratrue

(1)	Infinitely many parmāṇus	=	1 Avasannasannaskhandha
(2)	8 Avasannasanna units	=	1 Sannasannaskandha
(3)	8 Sannasanna units	=	1 Trutreṇu
(4)	8 Trutreṇu units	=	1 Trasareṇu
(5)	8 Trasareṇu units	=	1 Rathareṇu
(6)	8 Rathareṇu units	=	1 Uttamabhogbhūmibālāgra
(7)	8 U. b. b. Units	=	1 Madhyamabhogbhūmibālāgra
(8)	8 M. b. b. Units	=	1 Jaghanyabhogbhūmibālāgra
(9)	8 J. b.b. Units	=	1 Karma bhūmibālāgara
(10)	8 K. b. b. Units	=	1 Liksā
(11)	8 Liksā units	=	1 Yūkā
(12)	8 Yūkā	=	1 Yava (Barley corn)
(13)	8 Yava units	=	1 Angula (Finger breadth)
(14)	6 Angula units	=	1 Pāda
(15)	2 Pāda units	=	1 Vitasti
(16)	2 Vitasti units	=	1 Hasta (Forearm)
(17)	2 Hasta units	=	1 Rikku or Kisku
(18)	2 Kisku units	=	1 Daṇda or Dhanus (Bow)
(19)	2000 Daṇdas units	=	1 Krosa
(20)	4 Krosa units	=	1 Yojana

Here a parmāṇu has been defined as the smallest particle of matter havingno length, no breadth and no height. This is defined as a particle whichcan be only thought of but is not practically perceivable. The particle whichis perceivable is a group of parmānus. The smallest of such skandha is anavasannasannaskandha. Let us therefore estimate its size by roughly takingthe average size of a finger to be equal to 2 cm. We can therefore write thefollowing simple formula by using the above table :

2 cm = 8^{12} of size of avsannasannaskandha
Therefore Size of avsannasannaskandha = $2X8^{-12}$ cm. = $2.9 \text{ X } 10^{-11}$ cm.

Appendix 5. Implicate Order of Quantum mechanics and consciousness:

An abstract concept of "Order" has been also explored by David Bohm, who proposed a cosmological order radically different from generally accepted conventions, which he expressed as a distinction between the implicate and explicate order, described in the book (Bohm 1990).

In proposing this new notion of order, Bohm explicitly challenged a number of tenets that are fundamental to much scientific work. The tenets challenged by Bohm include:

1. That phenomena are reducible to fundamental particles and laws describing the behavior of particles, or more generally to any static (i.e. Unchanging) entities, whether separate events in space-time, quantum states, or static entities of some other nature.

2. Related to (1), that human knowledge is most fundamentally concerned with the mathematical prediction of statistical aggregates of particles.

3. That an analysis or description of any aspect of reality (e.g. Quantum theory, the speed of light) can be unlimited in its domain of relevance.

4. That the Cartesian coordinate system, or its extension to a curvilinear system, is the deepest

conception of underlying order as a basis for analysis and description of the world.

5. That there is ultimately a sustainable distinction between reality and thought, and that there is a
   Corresponding distinction between the observer and observed in an experiment or any other situation (other than a distinction between relatively separate entities valid in the sense of explicate order).

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

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

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

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

This implicate order of quantum mechanics as interpreted by David Bohm is very close to the Indian concept of consciousness and its relation to the whole world in general and the concept of reality in particular. This is also very close to the concept of Keval Jnana (absolute knowledge) as described in Jainism that is all knowledge disappear in this state and only absolute knowledge is left, which is in agreement with what Bohm is mentioning.

Appendix 6. Can a soul be an entity for which causality is neither obeyed nor violated.

In order to explain, the concept of soul as Indian philosophy in general, Pokharna (1985) has introduced an abstract entity for which causality is neither obeyed nor violated B. This is an entity for which causality is neither obeyed nor violated. The principle of causal connection points out that for every effect there is a definite cause behind it (or a large number of causes behind it) and every effect in turn becomes a cause of some other effect. Now when we say that causality is violated then it can have the following two different meanings : (i) when the causality is violated then this can mean that temporally the role of cause and effect has been reversed so that first we have an effect and then there is a cause. This is the situation believed to be existing in the case of tachyons (particles moving faster than light). They are assumed to be moving backward in time so it is said that causality is violated by tachyons. (ii) Violation of causality can also mean that there may be some effects (causes) whose causes (effects) may not be known to us or no physically reasonable causes (effects) can be searched for given effects (causes). This is the situation which we have found in quantum mechanics where we have found that there are some uncontrollable fluctuations in the predictability of the state of a system in a given measurement process. These fluctuations are such that we cannot assign any known factors or causes responsible for it. Hence this entity in search of perfect determinism.

Appendix 7. Quantum Consciousness:

The first detailed quantum model of consciousness was probably the American physicist Evan Walker's synaptic tunneling model (1970), in which electrons can "tunnel" between adjacent neurons, thereby creating a virtual neural network overlapping the real one. It is this virtual nervous system that produces consciousness and that can direct the behavior of the real nervous system. A few researchers have invoked another quantum effect, Bose-Einstein condensation which is a general case of superconductivity. A Bose-Einstein condensate is the equivalent of a laser, except that it is the atoms, rather than the photons, that behave identically. The intriguing feature of a Bose-Einstein condensate is that the many parts of a system not only behave as a whole, they become whole. Their identities merge in such a way that they lose their individuality. In 1986 the British physicist Herbert Froehlich suggested that such condensation can be achieved in Nature by biological organisms. In particular, it should arise when biological oscillators which are in a nonequilibrium state (such as all plants and animals) are maintained at constant temperature. The biological usefulness of such biological oscillators is that, like laser light, they can amplify signals and encode information (e.g., they can "remember" an external stimulus). In 1989 the British phychiatrist Ian Marshall showed similarities between the holistic properties of condensates and those of consciousness, and suggested that consciousness may arise from the excitation of such a Bose-Einstein condensate

Drawing from Quantum Mechanics and from Bertrand Russell's idea that consciousness provides a kind of "window" onto the brain, the philosopher Michael Lockwood advanced a theory of consciousness as a process of perception of brain states. First he noted that Special Relativity implies that mental states must be physical states (mental states must be in the space given that they are in time). Then Lockwood interpreted the role of the observer in Quantum Mechanics as the role of consciousness in the physical world. Lockwood argued that sensations must be intrinsic attributes of physical states of the brain: in quantum lingo, each observable attribute (e.g., each sensation) corresponds to an observation of the brain. Consciousness scans the brain to look for sensations. It does not create them, it just seeks them.

In 1986 John Eccles, the British neurophysiologist who discovered neurotransmitters, has speculated that synapses in the cortex respond in a probabilistic manner to neural excitation, a probability that could well be governed by quantum uncertainty given the extremely small size of the Synapsis'"microsite" that emits the neurotransmitter. If this is true, Eccles speculate that an immaterial mind (in the form of "psychons") controls the quantum "jumps" and turns them into voluntary excitations of the neurons that account for body motion.

The American physicist Nick Herbert has been even more specific on the similarities between Quantum Theory and consciousness. Herbert thinks that consciousness is a pervasive process

in nature. The mind is as fundamental a component of the universe as elementary particles and forces. The mind can be detected by three features of quantum theory: randomness, thinglessness (objects acquire attributes only once they are observed) and interconnectedness (John Bell's discovery that once two particles have interacted they remain connected). Herbert thinks that these three features of inert matter can account for three basic features of the mind: free will, essential ambiguity, and deep psychic connectedness. Scientists may be vastly underestimating the quantity of consciousness in the universe.

The computer scientist James Culbertson, a pioneer of research on robots, has even speculated that consciousness may be a relativistic feature of space-time. In his opinion, too, consciousness permeates all of nature, so that every object has a degree of consciousness. According to Relativity, our lives are world lines in space-time. Space-time does not happen, it always exists. It is our brain that shows us a movie of matter evolving in time. All space-time events are conscious: they are conscious of other space-time events. The "experience" of a space-time event is static, a frozen region of space-time events. All the subjective features of the "psychospace" of an observer can be completely derived from the objective features of the region of space-time that the observer is connected to. Special circuits in our brain create the impression of a time flow, of a time travel through the region of space-time events connected to the brain. The memory of an event is re-experiencing that space-time event, which is fixed in space-time. We don't store an event, we only keep a link to it. Conscious memory is not in the brain, is in space-time. The inner life of a system is its space-time history. To clarify his view, Culbertson presents the case of two robots. First a robot is built and learns German, then another robot is built which is identical to the first one. Culbertson claims that the second robot does not speak German, even if it is identical to the one which speaks German. Their spacetime histories are different. At the same time, Culbertson thinks that our consciousness is much more than an illusory travel through spacetime, and it can, in turn, influence reality. Quantum Thoery prescribes that reality be a sequence of random quantum jumps. Culbertson believes that they are not random but depend on the system's spacetime history, i.e. on its inner life.

Tripartite Idealism

The American physicist Henry Stapp holds that classical Physics cannot explain consciousness because it cannot explain how the whole can be more than the parts. In Quantum Mechanics, on the other hand, the relationship between the parts and the whole is completely different. Stapp therefore advances a "quantum theory of consciousness" and bases it on Heisenberg's interpretation of Quantum Mechanics (that reality is a sequence of the collapses of wave functions, i.e. of quantum discontinuities). Science specifies rules that connect bits of knowledge. Each of us is a "knower" and our joint knowledge of the universe is the subject of Science. Quantum Theory is therefore a "knowledge-based" discipline. This

view was "pragmatic" because it prescribes how to make experiments, and it was separating the system to be observed from the observer and from the instrument.

Stapp follows the logical consequences of this approach and achieves a new form of idealism: all that exists is that subjective knowledge, therefore the universe is now about matter, it is about subjective experience. Quantum Theory does not talk about matter, it talks about our perceiving matter.

Quantum-gravitational Consciousness

One of the strongest proponents of a theory of consciousness founded on Quantum Theory is Roger Penrose in person, one of the leading British physicists of our times. In his opinion, consciousness must be a quantum phenomenon because neurons are too big to account for consciousness. Inside neurons there is a "cytoskeleton", the structure that holds cells together, whose "microtubules" (hollow protein cylinders 25-nanometers in diameter) control the function of synapses. Penrose believes that consciousness is a manifestation of the quantum cytoskeletal state and its interplay between quantum and classical levels of activity.

The theory exposed by Penrose and his close American associate Stuart Hameroff is very detailed. The story begins with Penrose's distinction between "subjective" and "objective" reduction. Subjective reduction is what happens when an observer measures a quantity in a quantum system: the system is not in any specific state (the system is in a "superposition" of possible states) until it is observed, the observation causes the system to reduce (or "collapse") to a specific state. This is the only reduction known to traditional Quantum Theory. Objective reduction is a Penrose discovery, part of his attempt at unifying Relativity Theory and Quantum Theory.

Superposition states each have their own space-time geometry. Under special circumstances, which microtubules are suitable for, the separation of space-time geometry of the superpositioned states (i.e., the "warping" of these space-times) reaches a point (the quantum gravity threshold) where the system must choose one state. The system must then spontaneously and abruptly collapse to that one state. So, objective reduction is a type of collapse of the wave function which occurs when the universe must choose between significantly differing space-time geometries.

This "self-collapse" results in particular "conformational states" that regulate neural processes. These conformational states can interact with neighboring states to represent, propagate and process information. Each self-collapse corresponds to a discrete conscious event. Sequences of events then give rise to a "stream" of consciousness. The proteins somehow "tune" the objective reduction which is thus self-organized, or "orchestrated". Hence the theory of ORCH-OR has become quite popular.