

JAINISM :

The Eternal and Universal Path to Enlightenment
(A scientific synthesis)



NARENDRA BHANDARI

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Key to pronunciation

Some Hindi words (given in italics) have been used in this book since their literal translation into English do not convey the correct perception. The Hindi words are used with English grammar for convenience. Their popular spellings are given in Roman script and for common pronunciation four diacritical marks have been adopted as given below—

a = short a as in bat

ā = long a as in car;

i = short i as in hit;

ī = long i as in steep;

u = short u as in put;

ū = long u as in stoop;

ṇ = palatal n as in haunt

Publisher's Note

There is an ongoing debate in academic circles, and otherwise also, about the mutual antagonism between religion and science. The traditional proponents on both sides hardly yield any ground. However, with passage of time the number of the few with assimilative logical approach is growing.

In pursuance of our *Anekantic* approach we have been publishing books that mutually enrich science and spirituality. Some of our popular publications on scientific theme are — *Basic Mathematics, Astronomy and Cosmology, Rasaratna Samuchchaya, Ahimsa: The Science of Peace, Dravya Vigyan, Environmental Ethics, and Shat-dravya ki Vaigyanik Meemansa*. We are pleased to present this book by Dr. Narendra Bhandari, an eminent scientist, as another step in that direction.

The author explains basic concepts of Jainism and then proceeds to compare some aspects related to physics, cosmology, bio-chemistry etc. with what is mentioned on these themes in Jain scriptures. His approach is open and invites constructive debate as he states — 'My attempt is limited to making a synthesis of Jainism and science. Many aspects discussed in this book are subject to reinterpretation and further experimentation as our understanding of the Jain philosophy grows.'

As a highly evolved and logical philosophy Jainism does not believe in a creator God. It accepts the existence of this universe as eternal and divides it in two broad categories of the living (soul) and the non living (matter) in a state of continuous interplay. The study of the material dimension is dependent on sense organs and that of the spiritual dimension on mind and soul. Jain metaphysics is founded on the principle of cause and effect both in spiritual and material dimensions.

According to Jainism the ultimate goal of every living being (soul) is to purify consciousness to the level that the true nature of the universe becomes comprehensible. Consequently the interplay of soul and matter becomes vivid and the soul may go ahead towards breaking its ties with matter. The sense-organ-dependant perception has its own limitations. As such, the true nature of soul and matter cannot be rightly and comprehensively understood. For this Jainism takes the spiritual approach of self-realization. The tools prescribed for this are self-discipline and deep meditation.

The author raises questions in this regard — 'Is there a way, other than the scientific approach, to arrive at the true nature of the universe?' 'Can meditation lead to the same end results as the modern scientific tools?' 'And can both, science and meditation, be integrated into a single, holistic methodology?'

While exploring the possibilities he has selected some issues common to both science and spirituality. In order to establish common ground he resorts to reinterpreting the traditional beliefs, said to be based on scriptures, in modern terms based on current scientific knowledge. This is needed because it is difficult to ascertain authenticity of various texts. Many themes discussed in these texts contradict information on same themes in other texts, even of same antiquity. When compared with modern scientific observations it can easily be inferred that information on such issues given in these texts are not authentic and may have been corrupted by later elaborations. Thus it becomes essential to logically reinterpret and amend them by comparing with factual and irrefutably authenticated observations.

According to him — 'This book is an attempt to describe a few selected aspects of *Agams* in a simple way, with the aim to find a common ground between Jainism and modern science.' The lucid style and use of illustrations employed by Dr. Bhandari has made the book interesting for both scholars and general readers.

We are sure this book will prove to be another step in direction of healthy assimilation of the traditional and the modern by softening the prevailing dogmas on both sides.

D. R. Mehta

Founder & Chief Patron
Prakrit Bharati Academy, Jaipur

About the Book

The main aim of Jainism is to develop human consciousness to higher levels for which it specifies certain procedures. If practiced rigorously, these procedures can lead one to enlightenment. Evolutionary history of life on Earth reveals that nature also follows a well defined path to evolve consciousness to progressively higher levels and, in this quest, has come a long way from mono-cellular organisms to highly developed humans. Thus the goals of Jainism and nature are the same. The path or the Jain practices for attaining enlightenment are universal in the sense that these can be practiced by anyone desirous of seeking enlightenment. The book introduces basic principles and practices of Jainism and compares some of the modern concepts related to physics, cosmology, combination chemistry and biology with their description given in Jain scriptures.

Acknowledgements

I would like to acknowledge numerous sources from where material presented in this book has been taken; some of these are mentioned in the references.

I am indeed fortunate to have come in contact with Ācharya Vijay Nandi Ghosh Suriji Maharaj who initiated and inspired me to undertake this study. I am grateful to Dr. Jitendra B. Shah and Dr. Sudhir V. Shah for encouraging discussions in 'Jainism and Science Forum' at the L.D. Institute of Indology, Ahmedabad. Specifically, I am obliged to Dr N.L. Kachhara for critically reviewing the manuscript and making important suggestions, and to Dr S.S. Pokharna, Dr Jeoraj Jain and Prof. Rajmal Jain for useful discussions. I owe my deep sense of gratitude to Dr. Prabhakar Sharma for his painstaking efforts in improving the manuscript. For careful editing of the manuscript, I would like to record my grateful thanks to Shri Surendra Bothra. I also thank Neil Merchant for bringing Theseus paradox to my notice.

– *Narendra Bhandari*

Foreword

Jain philosophy deals with all aspects of life, material, psychical and spiritual, in a balanced way. It has the prescription for good physical and mental health, development of consciousness, and describes a path for attaining peace, enlightenment and liberation. Just as Science has propounded certain laws of classical and quantum physics which govern the material phenomena that are universal and have been validated experimentally, Jainism enunciates certain laws (e.g. *karmavād* and *anekāntavād*) which govern both, the living as well as the non-living.

Scientific discoveries have led to technological innovations that have revolutionized human life style in several ways, adding material comfort, better communication techniques and faster modes of transport. However, these developments have also resulted in over exploitation of natural resources, degradation of environment, global warming and led to several areas of conflict with nature and common welfare of the society. The Jain principles of *ahimsa* (non-violence), *apaigraha* (minimising ones material requirements and possessions) and *anekāntavād* (respecting other's views) are quite relevant in this context. An amalgamation of scientific and technological progress

with Jain ethics can lead to peaceful coexistence of all living species in a harmonious way. Non-violence, the main pillar of Jainism, is becoming increasingly relevant in today's strife ridden world. Violence is increasing alarmingly at all levels, i.e. individual, family, society, country as well the world as a whole. Proliferation of deadly nuclear and chemical weapons is posing a severe threat not only to the survival of human race but to all forms of life on the earth. Jainism emphasizes that everything in the universe is interdependent and non-violence should be an integral part of our lifestyle for peaceful coexistence and progress.

Despite tremendous progress in medical sciences, it has not addressed the fundamental questions concerning mystery of life and death that are vital to the understanding of the purpose of our life and what happens after death. Science has not investigated these aspects but oriental philosophies, such as Jainism and Buddhism, have dealt with them in detail. Jain seers and scholars have pondered over characteristics of *jiva* and *ajiva* not only on the earth but in the whole universe. Understanding of these aspects adds new dimensions to the purpose of life.

This book by a professional scientist, Professor Narendra Bhandari dealing with Jainism and science is an attempt to validate some of the basic tenets of Jain philosophy in the light of modern scientific thought. Some effort has also been made by the author to find consistencies between the Jain philosophy and the results obtained by modern scientific methods in different fields like physics, cosmology, chemistry and biology. I had an occasion to go through the manuscript and edit it. I find that this book presents all these aspects in an easily understandable and logical way and is indeed a laudable effort in comparing various scientific theories with Jain

principles. The ideal option seems to be to amalgamate the two, Jain philosophy and science and follow an enlightened life style, rather than just follow a materialistic approach. I hope this book will serve as a starting point for taking up further research on various principles described in Jain scriptures and make them relevant to the modern way of living.

With my Blessings and *Dharma Labh*

Ācharya Vijay Nandi Ghosh Suri

Mumbai

July 10, 2014

**Research Institute of Scientific Secrets from
Indian oriental Scriptures**

(RISSIOS)

Ahmedabad, Gujarat, India

Preface

Amongst various world religions, faiths or philosophical schools known to mankind, Jainism should not be considered as a religion in the conventional sense. It is essentially a path enunciated by the enlightened souls (*Arihants*) who were born as ordinary mortals but attained enlightenment by following the Jain path. These *Arihants* belonged to different societies during different eras. Therefore, practice of Jainism is not restricted to any particular group of people, time or place but can be followed by anyone desirous of seeking enlightenment. In this sense Jainism is universal, transcending barriers of nationality, class, colour or faith. There are undoubtedly many paths for attaining enlightenment, but Jainism advocates a practical and proven approach. It has well defined fourteen stages or milestones (*Guṇasthāns*) in this path (Chapter-5), in which *Guṇasthāns* 1 and 2 are considered as the starting points and the stage 14 is regarded as the ultimate goal of every human being.

Jainism lays as much emphasis on understanding the physical universe as on one's own physical, mental and spiritual development. Each one of these aspects is equally important for achieving *moksha*. Unlike some other oriental philosophies, Jainism does not consider the world as an illusion, nor does it believe in the existence of a supreme "God", regarded to be the Creator; rather Jainism is based on the premise that both, the living and the non-living, are governed by certain laws and, in this sense, it can

be regarded as having a scientific approach. It emphasizes that the law of causality is applicable in the spiritual realm as well, as it is in the physical systems, in the same manner as laws of physics are applicable to physical phenomena in the universe. There are, of course, several unresolved questions of fundamental import for both, those who believe in God and those who do not. These questions cannot be answered in a straightforward, logical manner. For example, one may ask the question – ‘If God indeed created everything, then who created God?’ The usual answer given is that He is eternal and self-created (*swayambhū*). The same question arises concerning the laws of nature that govern the universe, viz. ‘Who created these laws and why are the laws universal and eternal i.e. applicable everywhere at all times?’ We can only say that nature has always remained the same as we observe it today and the laws are eternal and inherent in the very nature of the universe and its constituents. But the question, why it is so, has not been scientifically answered yet. To understand the purpose of our existence and the laws that govern our lives, one must therefore strive to attain omniscience, which is the ultimate purpose of Jainism.

According to Jainism, the universe consists of soul (*ātmā*) and matter (*pudgal*) and four other entities (space, time, parameters of motion and rest) which facilitate soul and matter in their interactions (Chapter-7), resulting in a variety of *jīva* (living) and *ajīva* (non-living) entities. Everything we see in the universe is essentially a consequence of their mutual interaction. The ultimate goal of *jīva* is to completely free itself from matter and attain a state of purity, in which *jīva* and *ajīva* are completely isolated and free from each other’s influence, a state towards which the whole universe is evolving.

The basic tenet of Jainism is that every living being has a purpose in life and that is to develop his/her consciousness to its highest state whereby the true nature of the universe can be

realized. Our sense organs have limitations and therefore the true nature of the universe can not be correctly perceived through them. Humans are capable of conscious evolution, by will or effort. No other living species is endowed with this capability and all others are dependent on the environment for their evolution, either by its passive influence or by active interaction. Therefore, Jainism has laid the highest emphasis on humans, compared to other life forms.

Jain *darshan* is one of the oldest, original and independent philosophies, conceived and enunciated by the first *Tirthankar* Rishabhadeva in prehistoric times, who ruled over Greater India and adjoining regions. The time of his rule is not established precisely but it is certainly pre-Indus (older than 1500 BCE), since seals depicting Jain seers and practitioners of Jain yoga are found in Mohan Jo Daro, Harappa, Mathura and some other excavated archaeological sites. Inscriptions of *Siddhas* and *Arhats* (*Arihants*) have been found in Udaigiri hills and Hathigumpha. Names of some practitioners of Jainism are mentioned in *Rigveda*, considered to be the oldest Indian text dating back to about 3000 BCE and, a little later, in *Yajurveda*.

Considerable amount of research has gone into ascertaining the antiquity of Jainism, and to substantiate that, contrary to the popular notion, it is not an offshoot of the Vedic or Hindu philosophy. In fact many of the Jain concepts are against the Vedic philosophy, rituals and practices (such as animal sacrifices) and, therefore, it could not have emerged from the Vedic philosophy. Whereas Hinduism is ritualistic and believes in a Supreme omniscient and omnipotent God (the Creator) who controls everything, Jainism does not believe in the existence of any God but advocates practicing meditation and various penances by which any human can become omniscient. I do not wish to go into various evidences for independent origin and antiquity of Jainism here, except pointing out that names of several Jain *Arhats* (e.g. Rishabhadeva) and *sādhus* (called *Vrātya*

or *Vātarsana muni* or *Nigantha*) are mentioned in some of the oldest sacred Hindu scriptures, such as *Shri Bhagvat Purāṇa*, *Vishnu Purāṇa* and *Padma Purāṇa*. The interested reader may refer to some of these scriptures to appreciate the originality and antiquity of the Jain thought.

Over the millennia that have elapsed since the advent of the first *Tīrthankar* Rishabhadeva, Jainism propagated through practice as well as preaching. Historical records show that about 2900 years ago, Parshvanath, the 23rd *Tīrthankar*, preached the *Chāturyāma Dharma*, the four-fold religion, based on practice of non-violence (*ahimsā*), truthful living (*satya*), abstinence from stealing (*achorya*) and non-accumulation of material things (*aparigraha*). About 250 years later, the last (24th) of the *Arihants*, Mahavira introduced celibacy (*brahmacharya*) or ethical sexual conduct as an essential requirement for attaining liberation. These five ideal codes of conduct (*mahāvratas*) constitute the foundation of Jain practices but, in addition, Jainism has a well developed scientific, metaphysical as well as theoretical foundation. The basic aspects of Jainism were compiled by the immediate disciples of Bhagavan Mahavira (599 BCE–527 BCE). These disciples, called *Gaṇadhars*, were *Shrut Kevalis* (scholars of the knowledge given orally by the *Tīrthankars*) who described various concepts as well as practices propounded by them. These teachings were memorized *verbatim* by sages and transmitted to their disciples orally for several successive generations until they were compiled in the form of scriptures, known as *Āgams*, several hundred years after the passing away of Mahavira. These *Sūtras* were divided into two major groups: *Anga Āgams* comprising 12 texts that contain direct preaching of Mahavira and *Anga-bāyha Āgams* which provide explanation of the *Anga Āgams*. Various Jain sects differ on the number of *Anga-bāhya Āgams*, which range between 14 to 45.

Around 350 BCE, about 250 years after Mahavira's *nirvana*, there was a long spell of severe famine lasting for twelve years. This resulted in a hiatus in the tradition of memorizing *Āgams* and during this period a significant number of *Āgam Sūtras* were largely forgotten. The Digambar Jains consider *Shatakhandāgam*, written by Āchāryas Pushpadant and Bhutbali (and its commentary *Dhavalā Tikā*, by Āchārya Virsen), *Kashāya Pāhuda* by Āchārya Guṇadhara between 100 to 900 CE (and its commentary by Virsen and Jinasen), and four *Anuyogas* (which include about 20 texts) as their main scriptures. These four *Anuyogas* consist of *Padma Purāṇa*, *Harivansh Purāṇa*, *Ādi Purāṇa* and *Uttar Purāṇa*, written between 650 and 879 CE, which constitute *Dharma Kathānuyoga*; *Charaṇānuyoga* (consisting of *Mūlāchār*, *Trivarnāchār* and *Ratnakaranda-Shrāvākāchār*); *Gaṇitānuyog* (consisting of *Surya-prajñapti*, *Chandra-prajñapti*, *Jaya-Dhavalā-Tikā* and *Gommattasār* (written 780-1000 CE) that deal with astronomy, astrology, geography, and mathematics. The philosophical doctrines, theories, metaphysics, and *Tattvajnāna*, are contained in *Dravyānuyoga* which consists of *Niyamasār*, *Panchāstikāya*, *Pravachanasār* and *Samayasāra* written by Āchārya Kundakunda (circa 100 CE); *Tattvārtha Sūtra* by Umaswati (200 CE) and its commentaries and *Āptamimāmsa* by Samantabhadra (600 CE) and its commentaries by Akalank and by Vidyanand (800 CE).

Shvetambar Jains, on the other hand, held a number of conferences¹ at Patliputra (circa 367 BCE), Orissa (150 BCE), Mathura (310 CE) and two at Vallabhi (454 CE and 300 CE). These were held in order to document the scriptures that could be retrieved from the memorized versions. The Shvetambar texts include: 1. *Āchārāṅga Sūtra* describing the conduct and behavior of ascetics and penances observed by Bhagavan Mahavira. 2. *Sūtrakritāṅga Sūtra* describing non-violence, Jain metaphysics, and refutation

1. Based on *Jain Āgam Sahitya* by Devendra muni. Other scholars have given slightly different dates for the conferences.

of other religious theories such as *Kriyāvād*, *Akriyāvād*, *Ajnānavād*, and *Vinayavād*. 3. *Sthānāṅga Sūtra* and 4. *Samavāyāṅga Sūtra*; both (3 and 4) describe various aspects of Jain metaphysics. 5. *Vyākhyā Prajñapti* or *Bhagavatī Sūtra* that explains the subtle aspects of soul, matter, and other related subjects. Thirty six thousand questions and their answers are presented in this text for clarifying various concepts related to the Jain philosophy. It is the largest of the eleven *Anga Āgams*. 6. *Jnātā Dharma Kathāṅga Sūtra* that explains the basic principles of Jainism through real life examples as well as anecdotes. This text is useful in understanding the mode of Bhagavan Mahavira's religious discourses. 7. *Upāsaka Dashāṅga Sūtra* that explains the code of conduct of Jain followers (*Shrāvaka Dharma*). 8. *Antahkriddashāṅga Sūtra* that describes anecdotes of some monks who attained liberation from cycles of birth and death (*moksha*) by expiating their *kārmic* retribution through the practice of Jainism. 9. *Anuttaraupapātika Dashāṅga Sūtra* contains anecdotes of some monks who attained the highest *Anuttara* heaven. 10. *Prashna Vyākaraṇa Sūtra* that describes the five ideal codes of conduct or Great Vows (*mahāvratas*) and the five worst sins defined in Jainism. 11. *Vipāka Sūtra* that explains the results of good and bad *karmas* through several anecdotes. 12. The twelfth *Anga Āgam*, *Dristivād*¹, which is of vital importance and, although it has been lost, its description is found in other Jain *Sūtras*.

Dristivād is divided into five parts: (1) *Parikarma*, (2) *Sūtra*, (3) *Pūrvagata*, (4) *Pratham-anuyoga*, and (5) *Chulika*. The third part, *Pūrvagata*, contains 14 *Purvas* which are invaluable treasures of basic concepts of Jainism on various subjects. Some scholars

1. There are 12 original scriptures (*Anga Āgams*) of Jains, but the last one, *Dristivād*, comprising of 14 *Purvas*, was lost long time ago. It has been referred to in *Samavāyāṅga Sūtra*. Its 7th *Purva*, referred to as *Ātmapravād*, deals with six fundamental aspects of Jainism which are described by Āchārya Siddhasen Diwakar in *Sanmati Prakaraṇ* about 1800 years ago (cf. *Atmasiddhi* written by Srimad Rajchandra).

believe that it was named *Pūrva* because it contains the knowledge which existed before the advent of Bhagavan Mahavira, mainly the preaching of Bhagavan Parshvanath. The legend has it that Srimad Rajchandra (1867-1901 CE) could recall the 7th *pūrva* through the knowledge gained in his previous birth (*Jātismaran*), which he, in one of his previous lives, had heard directly from Bhagavan Mahavira as one of his disciples and summarized it in his book *Atmasiddhi* (see Chapter-2). This is generally considered as an authentic version of this part of *Drishtivād*.

Various *Shvetambar Upāṅgas* illustrate the teachings of Bhagavan Mahavira through several anecdotes and include *Aupapātika Sūtra* which summarizes the sermons given by Bhagavan Mahavira to King Konika. It also explains how a person can attain heaven in the next life; *Rāja Prashnīya Sūtra* describes the anecdote of sage Keshi who was the *Gaṇadhar* of Bhagavan Parshvanath. He clarified the doubts of King Pradeshi concerning the existence and attributes of soul. *Jīvābhigama Sūtra* describes the universe and gives a vivid description of all living beings of the universe. It deals with various aspects of biology and botany. *Prajnāpanā Sūtra* describes various perspectives of the form and attributes of soul. *Surya Prajnapti* and *Chandra Prajnapti* deal with astronomy, motions of Sun and Moon and *Jambūdīvīpa Prajnapti* deals with geography. The other *Sūtras*, viz. *Nirayavali Sūtra*, *Kalpavatansika Sūtra*, *Pushpika Sūtra*, *Pushpa Chulika Sūtra*, and *Vrishnidasha Sūtra*, describe some incidents and anecdotes from ancient times. Besides, there are several *Mūla* (basic) *Sūtras*, such as *Āvashyak Sūtra* (essentials; Chapter-6) describing the daily rituals or chores which are necessary for purification of soul. A description of the six routines, viz. *Sāmāyik*, *Chaturvinshatistava*, *Vandana*, *Pratikramaṇa*, *Kāyotsarga*, and *Pratyākhyāna*, are explained in this *Āgam*. *Uttarādhyayan Sūtra* describes various religious principles, practices, dialogues, and examples. *Chulikā Sūtras* (e.g. *Nandi Sūtra*, dealing with various types of knowledge i.e. *jnānas*) are also among the main *Upāṅgas*.

The purpose of mentioning the principal Jain scriptures here is two-fold. Firstly, they provide the source material on Jainism so that the reader interested in the original texts can refer to them. Secondly, and more importantly, it should be emphasized that these texts are mere compilations of recollections made by various *Āchāryas* many centuries after Mahavira's *nirvāna*. In view of the inaccuracies in oral transmission of the *Sūtras* from one generation to the other over many centuries, imperfections of human memory, subjective interpretations, besides the influence of other contemporary schools of philosophy, *Āgams* should be critically evaluated before they can be considered as the "word of the Lord".

It should also be borne in mind that the original preaching of Mahavira was in colloquial Prakrit, a language and its dialects that got confined to academic circles long ago (around 10th century CE). They were gradually replaced by Sanskrit and other regional languages, including modern Hindi, which evolved from Prakrit. Although the original concepts and cardinal points of the philosophy appear to have, by and large, survived over the long period of time, it is difficult to comprehend the intended meaning of some *Sūtras*. Various discrepancies between Shvetambar and Digambar texts highlight the problem of inaccuracies which have crept in these compilations. For example, some aspects, such as the units of time and dimensions of space and data related to geography, cosmology and astronomy, given in these compilations are at variance with each other, further raising doubts about their credibility. On comparing them with modern scientific observations, one comes to the conclusion that many aspects described in the texts, at least their interpretations, may have been corrupted by later influences. This is sufficient reason to critically examine, reinterpret and correct them by comparison with modern scientific observations and/or theoretical understanding.

The methodology of science is objective in the sense that it examines and analyzes various objects/events in the universe,

independent of the observer. On the other hand, religion is concerned with the self. The approach of science is experimental whereas that of religion is experiential. There are areas where religion and science are mutually exclusive, e.g. in the realm of spiritualism. However, there exist areas where there is some overlap between them, since as mentioned above, Jainism lays as much emphasis on physics, chemistry, biology, botany, astronomy and geography, as it gives to spiritual aspects of soul, and procedures for its purification. The questions that therefore arise are — “Is there a way, other than the scientific approach, to arrive at the true nature of the universe?” Can meditation lead to the same results as the modern scientific tools?” Can both, science and meditation, be integrated into a single, holistic approach to understand the nature of the universe? To seek answers to these questions, one has to debate issues which are common to both, science and religion. There are bound to be some disagreements but our effort in this book is to reconcile Jainism and science to the extent possible.

This book is an attempt to describe a few selected aspects of *Āgams* in a simple way, with the aim to find a common ground between Jainism and modern science. The book begins with an introduction to the basic concepts of Jainism, both theory and in practice, and the procedures suggested for attaining enlightenment. It is not an authoritative treatment of the Jain philosophy, which is quite profound, but rather a primer where rigor may have been sacrificed for the sake of simplification of the concepts involved to make them understandable to the reader who is not familiar with the Jain philosophy.

Jainism is based on five pillars — theory of soul (*Ātmavāḍ*), theory of action and thought (*Karmavāḍ*), theory of multifacetedness of nature (*Anekāntavāḍ*), Jain Practices for purification of soul (*Kriyāvāḍ*) and theory of the universe (*Lokavāḍ*) — that form the subject matter of this book. It is divided into two parts, the first part dealing with the first four aspects and the second part

dealing with some specific aspects of *Lokavād*. Thus, the first part deals with basic tenets of Jainism and the second part compares the Jain thought with various branches of science like physics, cosmology, chemistry and biology. After highlighting the universal applicability of Jainism (Chapter-1), the book deals with the foundations of Jainism, including the Cardinal Truths (Chapter-2), *Anekāntavād* (Chapter-3) and *Karmavād* (Chapter- 4). There are numerous comprehensive books and treatises available on these aspects and therefore they are discussed only briefly. The latter section of this part (Chapters-5, 6, and 7) deals with the path advocated for attaining liberation, as one goes to higher spiritual states (*Guṇasthāns*, Chapter- 5), by following various Jain practices (Chapter- 6). The second part of the book deals with a general discussion on the Jain concepts vis a vis modern scientific knowledge, including modern physics (Chapter-7), cosmology (Chapter-8), combination chemistry (Chapter-9) and biology (Chapter-10). The book ends by describing some aspects of peace in the world, which we are all striving to attain.

I hope that the book will serve as a bridge in our understanding of Jainism in the context of modern science, provide a scientific basis to Jain concepts and, more importantly, make Jainism relevant to the modern way of life.

– *Narendra Bhandari*

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CHAPTER-1

The Universality of Jain Principles

Truth is interwoven in the Universe

➤ *Universality of Jainism*

➤ *Fossil record on Earth, Nature's chosen path*

➤ *Self and foundations of Jainism*

Origin and Universality of Jainism:

The concept of religion, in the form of a code of conduct, must have dawned early in the history of human civilization as the thinking but helpless primitive *homo sapiens*, appeared on the Earth and stepped out, bewildered by the mysterious nature around him. Survival against various natural hazards must have been his instinctive and prime concern, as we may well imagine, and his first realization must have been total dependence on the surroundings – biosphere as well as geosphere. He must have been awestruck by the sight of a variety of animals in the wild, some of whom slowly became his close companions. Soon he must have realized the futility of resorting to violence and advantages of developing friendly relationship with every living being in his surroundings. In view of his close interdependence with others, the principle of non-violence (*ahimsā*) must have naturally dawned on him. The primitive man must have also wondered about his surroundings, including objects in the sky — the Sun, the Moon, stars — and also those on the Earth, including trees, rivers and

mountains. The ecstasy of his understanding of the natural surroundings, such as daily movement of the sun, moon and stars, and seasonal changes in the surroundings must have led him to realize that nature follows certain regularity or laws that he should unravel to understand the processes that govern the universe.

Since he did not own any material thing, or we may say, he owned everything around him, the concept of ownership was not prevalent in those early days. As his needs were based on what was available or, in other words, everything he needed was freely and abundantly available, there was no need to possess or store material resources and the concept of accumulating material things must have been alien to him. As man started living in groups, some concepts evolved which ultimately led to a code of conduct, or religion. The three primary principles, viz. non-violence, search for basic natural laws (truth) and non-possession of material resources, which constituted the code of conduct of the early man are essentially the same as the three *mahāvratas* (or ideal codes of conduct, see Chapter-5) of Jainism. These codes of conduct appeared to be simple and were formulated much before the notion of God was conceived, to explain certain events which could not be understood by man. Thus we can assume that the cardinal principles of natural religion were conceived early and eventually became the three cardinal principles (*mahāvratas*) of Jainism.

Jainism can thus be considered as the primary, natural, humane religion, born out of consideration for harmonious living of man with his surroundings and companions. Non-stealing (*achorya*), as the fourth *mahāvrata*, was probably incorporated much later, driven by the need of equitable distribution of the limited resources in nature. The fifth *mahāvrata*, ethical sexual conduct (*brahmacharya*) was introduced by Mahavira about 2600 years ago as the society developed into a complex multi-cultural system to maintain harmony in the family and the society at large. These

simple, basic, personal, social and ethical codes of conduct have no element of faith, religion or subjectivity and should be generally acceptable to any civilized society. None of these have any roots specific to Jainism and yet they are the same codes of conduct that Jainism advocates. The contribution of Jain philosophy is that by practicing these codes of conduct rigorously, in thought and in deeds, the soul remains free of material and psychological bondage (*karma*). Furthermore, by following some other practices (Chapter-5), soul can shed *karmas* previously acquired by it and become free from material bondage, thereby attaining a higher state of consciousness. A pure, bondage-free soul is self enlightened. This is the Jain path to enlightenment.

Starting from the early simple, though hazardous life style, the society has progressively grown into a complex system. Present day life involves multitude of complex situations and we continuously move from one situation to another to achieve the desired outcome. In our never ending quest to be happy, by acquiring material possessions, we face the real life situations grudgingly, wasting our time and effort on things that are of no real consequence. Sooner or later, we realize that our life has been wasted fighting trivialities and in the ultimate analysis, life turns out to be a zero sum game. The outcome would not be much different even if one had chosen some other way of livelihood or life style. This vain struggle can hardly be the purpose of life. In this Chapter, we describe the nature's scheme based on evolutionary history of life on Earth and show that it has a sublime purpose of increasing the level of consciousness. All 'religions', in fact, offer pathways to understand and realize this purpose.

Every age has had its specific problems in various spheres of life, in all possible situations, and a 'true religion' is expected to show a way to resolve these problems. Problems involving personal, societal and national issues, unabated terrorism, consumerism, and

impact of the modern life style on environment, to cite a few, are hallmarks of the current era. Science and technology are progressing at such a rapid pace that human mind is unable to adapt to and cope up with the technology based life style. The result is that philosophical and spiritual development of mind are lagging behind the material progress. There is neither time nor inclination to distinguish between right and wrong, good and evil. Every time a scientific discovery is made, technical progress follows quickly and gains an overriding control of our lives. In comparison, it takes the human mind considerable time and effort to comprehend, assimilate, philosophise, transform and understand the long-term implications of a scientific discovery.

Science has made tremendous progress in the past four centuries since Galileo discovered the laws of motion. Failure of various world religions to cope up with the progress of science in a harmonious way has made them inadequate for addressing the present day problems. In the event of a conflict between science and religion, the tendency is to repose faith in science, because it has helped us fight hunger and disease and made our life comfortable, thus becoming increasingly relevant. To make philosophy and religion relevant to modern lifestyle requires that the eternal values they profess be reinterpreted in the light of recent scientific discoveries and technological developments so that they can meet the contemporary as well as the emerging challenges. Our approach, therefore, should be to synthesize and integrate science with religion to make both of them more inclusive, wholesome and comprehensive. Instead, the puritans take recourse to the age old interpretations and religious rituals and follow them literally, even if they are obsolete, impractical and inapplicable to address problems of present day life. This probably is the main reason why people, even while following their religion rigorously, end up with gradual erosion of their faith in it.

There is no absolute criterion for judging whether a particular concept or practice is right or wrong. Being in psychological and spiritual domain, they are subjective and what appears right today in a given context may be wrong tomorrow in another situation. In such a confusing scenario, it is difficult to identify the right path. For this purpose, it must be realized that we all are products of nature, which is supreme and all powerful. We should, therefore, take recourse to nature to understand its chosen pathways and follow it to the extent possible. We therefore first discuss the path that nature has adopted so far.

Scientific studies have shown that the universe came into existence from a great explosion, called the “Big Bang”, about 14000 million years ago, the earth came into existence about 4500 million years ago and primitive life first appeared on earth 3500 million years (or at most 3800 million years) ago. Since then both, *jīva* and *ajīva*, on earth have evolved in a certain direction. At present, we seem to be caught between two conflicting choices: either we take recourse to science and technology, which is based on exploitation of natural resources in order to provide us more and more physical comforts, or we adopt the path the earth has taken over the ages by which the primitive algae has evolved to intelligent, all comprehending, humans over the aeons. The former choice leads to confrontation with nature, whereas the latter is in harmony with it. Thus, we can take clue from nature itself, first by determining the goal towards which it is heading and then proceeding in harmony with it in that direction. Such an approach would indeed be ethical, rational, logical and correct in the absolute sense.

Nature’s chosen path based on fossil records:

The earliest fossil records show that life on the earth started about 3500 million years ago as mono-cellular organisms (algae). How the life on earth actually originated is not well understood yet. The exogenic theory invokes that the seeds of life came from space riding on comets, meteoritic dust and interstellar grains. On

Evolutionary history of life

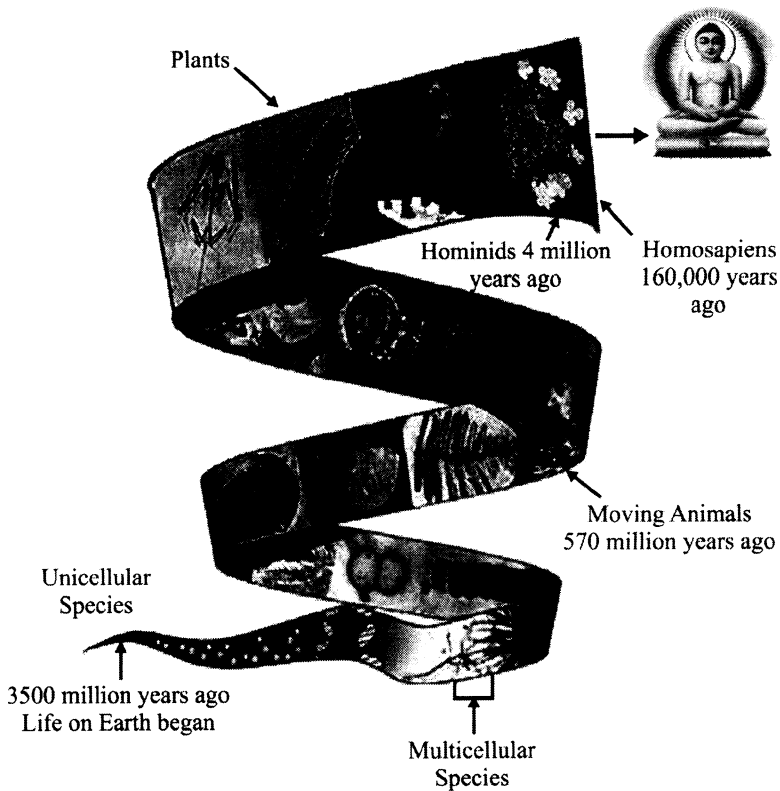


Figure- 1. 1: The evolutionary record of species on earth, beginning with single-celled species to multi-celled species, to marine species, mobile animals, plants, mammals and flying species and finally to humans. Predecessors of humans (Hominids) first appeared on the earth about 4 million years ago, rapidly evolving into man (Homo sapiens) who first appeared about 160, 000 years ago. Time is increasing upwards.

the other hand, the endogenic theory postulates that the chemical organic molecules, the building blocks of life, got together and assembled in the sea, which acted as a biogenic soup, to form living species. Both the theories are currently being debated although recent studies have provided evidence that appropriate conditions exist in molecular clouds in the interstellar space where biomolecules can form.

Evidence of what happens on Earth, in the form of any activity involving either the living or the non-living, gets washed off by rain, drains into rivers and eventually into the sea where it gets sequentially deposited at the sea floor with layers of dust. The history of life on earth is thus preserved as fossils in the sea-sediments at the bottom of the oceans. When the sediments were deposited can be estimated by some “dating” techniques. It has been estimated from these records that there were no sign of life during the first billion years of earth’s history (4500 to 3500 million years ago). Then suddenly simple uni-cellular micro-organisms, the first prokaryotes, appeared. They existed and evolved for about two billion years longer than the multi-cellular (eukaryotic) organisms and slowly evolved into mobile and flying species. Mammals and humans arrived on the scene only recently. The *Hominids*, which are considered as predecessors of humans, emerged about 4 million years ago. This sequence, or the tree of life, is shown schematically in Figure- 1.1. The history of evolution of species on earth shows that, over the ages, the mono-cellular algae has gradually and progressively evolved into more complex and developed species, not only physically, with better sense organs, but also mentally, along with higher levels of consciousness. Thus the mother nature, endowed with all the resources at its disposal, has been following the singular goal of developing consciousness to ever increasing levels as shown in the pictorial representation of the fossil record with time in Figure- 1.1.

Thus we find a pattern in fossil records which indicates that nature has followed a well defined path for billions of years that has increased the level of consciousness of species. We may, therefore, infer that every action that raises consciousness to a higher level is in conformity with nature and is righteous; This natural path can be considered as the true path i.e. ‘*dharma*’. Thus *dharma* and consciousness can be considered as synonymous; any act which increases the level of consciousness is *dharma*. On the contrary, any activity which decreases the level of consciousness

is retrograde or '*adharma*'. In this way, the natural fossil record allows us to define *dharma* scientifically, that is going along with nature and helping in its goal of increasing consciousness on the earth.

In Jainism, the level of consciousness is defined by the number of senses possessed by a *jīva*. Jainism classifies various species in terms of the number of their senses, from one-sensed (faculty of touch) to five-sensed (involving faculties of touch, smell, taste, hearing and vision). In the course of its evolution, nature seems to have started with one-sensed organisms and progressively evolved into five-sensed organisms or mammals. Jainism also specifies five types of knowledge (*jnāna*): *Mati* (intuitive), *Shruti* (interactive), *Avadhi* (clairvoyance), *Manahparyav* (telepathy) and *Keval* (omniscience), as discussed in Chapter-6. The physical and mental evolution of species, as reconstructed from the fossil records preserved in deep sea sediments, show that the evolution of consciousness has followed the same trend, that is, acquiring knowledge from lower modes (*mati jnāna*) to progressively higher modes. Extrapolating this trend into the future, it can be predicted with reasonable certainty that the level of consciousness will evolve further with passage of time and a “super human” species may eventually evolve. Nature’s ways of enhancing the level of consciousness, involving whole of the biosphere and geosphere (land, ocean and atmosphere), by the Darwinian evolution based on their mutual interaction is a slow process. Jainism advocates a methodology to consciously and quickly elevate the level of consciousness, as discussed in Chapter-6. By following various Jain practices, one can acquire *keval jnāna* and become an omniscient, thus taking evolution to a higher level.

Salient features of Fossil Records:

Studies of the fossil records in deep sea sediments have revealed many other features, some of which are summarized below.

1. As already mentioned, physical evolution accompanied by increase in consciousness level has been the path followed by nature. The evolutionary record of species on earth suggests this direction, beginning with single celled species to multi-celled species, to marine species, mobile animals, plants, mammals and flying species (birds) to humans. The fossil record also shows that, whereas physical evolution occurs gradually, evolution of consciousness occasionally may take a big leap. In the history of life on earth, five such revolutions have been identified. The first is the origin of life, about which we know little. The most primitive, the mono-cellular species like algae (prokaryotes), remained completely dependent on environment for their survival and natural transmutations for evolution. Next came a higher level of species, which proactively interacted with their surroundings and evolved themselves by environmental interaction. This was a major breakthrough, being the second and most important revolution. The third big revolution took place when species, which were hitherto immobile (*sthāwar*), acquired mobility, i.e. they could move from one place to another, with the onset of Phanerozoic era. This happened about 550 million years ago. The fourth revolution is the appearance of mammals. The last big leap, the fifth revolution, is the appearance of humans who could consciously evolve on their own and could even influence the environment in which they live. This last phase of evolution started only about 4 million years ago with the appearance of hominine genus, *Ardipithecus* and finally *Homosapiens*, the modern man, appeared only about 160,000 years ago. It is clear from this record that the development of consciousness over geologic times has not occurred at a uniform steady rate but with an accelerated pace with time. The next revolution does not seem to be far away and we are probably already at its threshold.

A prime requirement for evolution is energy. Plants and undersea organisms adopted a direct process of getting energy

from the environment through physical/ inorganic sources (e.g. via photosynthesis and methanogenesis), whereas other species found a way of getting energy through biological processes, for example, from organic materials like food. In this chain of evolution, we note that the physical complexity, level and mode of acquiring knowledge (learning process) and the level of consciousness evolved simultaneously. The most primitive of the species (algae) had only *mati jñāna* and subsequently the higher species (e.g. mammals) developed *shruti jñāna*. Humans have discovered laws and developed methods of calculation by which they can acquire a kind of *avadhi jñāna* transcending limits of both space and time. They could reasonably well estimate what happened in the remote past anywhere in the universe and could also, to some extent, predict the future. The evolution of consciousness thus has been accompanied by acquisition of a higher state of *jñāna*, i.e. from *mati* to *shruti* to *avadhi*, as can be seen from the species that existed at various epochs of time in this evolutionary sequence. Extrapolating this into the future would imply that further evolution will lead to higher levels of consciousness and *jñāna* with time, that is to *manahparyav* and ultimately to *keval jñāna*. There is nothing which remains to be known further after one has acquired *keval jñāna* and if nature continues to have its way, *kevalis* will eventually appear on the earth in abundance. Although this is an extrapolation based on scientific logic, it looks almost inevitable.

2. The fossil record shows that the evolution is accompanied not only by development of newer species, but extinction of some of the older forms of life. Creation of new species and extinction of prevailing species go on simultaneously. Sooner or later, each and every species on earth (including humans) will become extinct and will be gradually replaced by newer species. Thus we see that extinction is the ultimate fate of all species.

3. Evolution is not a sequentially progressive phenomena but is based on random selection from the existing species. A few selected species from a large diverse population, based on some unpredictable natural criteria can evolve faster. This conclusion is based on the observation that the species with higher level of consciousness can evolve, not necessarily from amongst the highest level of the existing species but from any level, even from much lower species. There are many instances where a lower species has given rise, by a quantum jump, to a much higher level of species. This implies that we cannot predict which species will evolve to the next higher level and when. For this reason all forms of life must be regarded as sacred and need to be preserved for further evolution. Disappearance of even very 'low' ranking species may delay or derail the process of attaining higher level of consciousness by the Darwinian process of natural selection or by one's own efforts.

Based on the observation of physical characteristics of various species and their inter-relationships, Darwin concluded that they must have evolved over time in diverse ways as a consequence of interaction with their environment. He found that life is a process of constant struggle for existence and only the fittest survive and evolve by the process of natural selection. One point that emerges from Darwin's theory is that evolution is a product of two processes which are operating all the time: interaction and adaptation. Both are the characteristic traits of soul, i.e. consciousness. Adaptation essentially means learning. Evolution, however, is not confined to physical evolution only; the underlying motive force is consciousness. Whether mechanical interaction with the environment leads to physical evolution of the brain or conscious forces, by interaction with matter leads to learning process that, in turn, further raises the consciousness level, remains to be resolved by research at the molecular or psychical levels.

Evolution, like *karma* (Chapter- 4), has two components: *Sanchit*, the cumulative evolution from the single celled algae to humans, and *arjit*, the extent to which we evolve in the present life. Thus we owe our present state of consciousness, indeed our very existence, not only to “our” past lives or to our parents but to the lives of all the preceding species which have existed till now,

Common root of Life on Earth

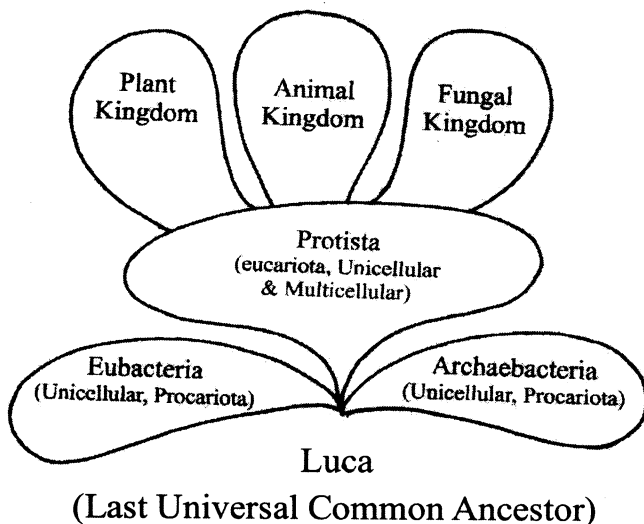


Figure- 1. 2 : The Phylogenetic Tree indicating a common root, LUCA (Last Universal Common Ancestor) for all plant and animal kingdoms on the Earth. (source : Wikipedia)

alive and dead; extant and extinct. This is the fundamental concept leading at once to the concept of non-violence. As far as we can extrapolate from the above discussion, the evolutionary trend of consciousness should continue in the future. This, then, is the path the nature has set for itself, with the goal of raising the consciousness to ever increasing levels.

The question now arises, ‘Can we humans, by some technique, attain the next state of consciousness, which, in comparison to our present state, may be considered a more enlightened state?’ It may

just only be a small step away. According to Jainism, 'it is possible'. This is what Jainism is all about. At any point of time, the population has a wide range of consciousness levels. A small fraction is highly advanced, at the highest level of consciousness, most are at the average level and a few are at the lower end. The distribution should be similar to the well known Maxwellian distribution of energy. Those at the highest level are close to the next stage where nature is going to take us in normal course of time by Darwinian evolution. Such persons, by practicing the techniques propounded by Jainism (as discussed in Chapter-6), and possibly by other paths as well, can attain the next level of consciousness.

Common root of life on Earth:

An important point that may be noted here concerns the structure of living species. All species are symmetrical in their physical attributes. For example their bodies have a binary system (two eyes, two arms, two legs etc.). All the life on earth, therefore, probably has originated from the same root. There are three basic types of species on the Earth: Archea, Bacteria and Eucarya and it has been speculated that both plant and animal kingdoms have originated from them (Figure- 1.2). In essence, all of them have a common ancestor. If this is true, all of them may have the same roots as can be seen in the phylogenetic tree of life shown in Figure- 1.2.

Origin of Life:

There is another fundamental point to be noted in the context of Jainism which postulates that *jīva* (*Ātmā*) and matter (*pudgala*) are separate and independent, beginning-less entities that exist, without having been created. They are eternal, everlasting, coexisting, interacting with, and influencing each other, changing, yet retaining their individual identities. While *Ātmā* is endowed with the attribute of consciousness and is sentient, incorporeal, non-material, formless, weightless, colorless, odorless, and eternal,

matter is a corporeal, non-sentient, non-psychical, and inert entity. One cannot be produced from the other. Modern scientific theories suggest, though without much evidence, that life may have originated from matter. The probability that various molecules, even if they are available, will randomly assemble in such a way that they will give rise to living species is negligibly small, calculated by some scientists to be 10^{-140} . This is too small a value to result in any organized structure required even for the simplest species over the life time of the universe.

Yet scientists have hypothesized, after a prolonged debate, that there may be favorable conditions, architecture, catalysts and templates under which the molecules can get together swiftly to form complex large organic molecules first and then living organisms. Search for such routes to life are continuing. This hypothesis got a big boost by the experiments of Miller and Urey during the last century. In these experiments, when an electric discharge was passed through a mixture of simple molecules like carbon dioxide, ammonia, water and methane etc., complex large molecules, like amino acids, proteins and similar building blocks of life were formed quickly. This, and similar such experiments, however, have not produced even the simplest or the most primitive living organism.

Scientifically matter and energy are interconvertible. Matter (characterised by having mass, M), which is corporeal and inert, can be converted into energy (E), and vice versa, in accordance with the Einstein's famous equation $E=Mc^2$, where c is the velocity of light. Although energy, necessary for any physical or biological process can be materialised, science has not addressed some of the fundamental questions, such as: 'How can an entity devoid of consciousness, such as inanimate matter, give rise to something endowed with consciousness which is a distinguishing characteristic of the animate forms? Is life just a simple aggregate

of chemical elements or there is something more to it? Can an assemblage of material components spontaneously produce self-conscious mind that is aware of itself?’ In day to day experience we see that only life can give rise to life and it is impossible to produce life from inanimate matter. Jainism has resolved this problem by postulating presence of souls everywhere in the Universe and when a chemical structure is suitable, an appropriate soul enters it and makes it alive. These questions are debated further in Chapters-2 and 10.

Universal Principles:

On the basis of fossil record, we have shown above that all types of life play an important role in the nature’s journey of enhancing consciousness level on the earth. Every species, lower as well as higher, must therefore be considered sacred and treated with dignity. Non violence and coexistence of all living species are essential for this purpose and therefore these should be considered as universal principles. Jainism subscribes to the same concepts and in this sense Jainism can be considered as natural and universal philosophy.

Furthermore, every living species should get an opportunity to develop itself to the fullest extent and improve its physical, mental and spiritual well being to evolve to a state of higher level of consciousness. There are some general requirements for accomplishing these objectives, viz. all life forms should benefit equitably and not selectively; in other words the progress should be all inclusive and not exclusive. Physical well being requires principle of sharing and equitable distribution of resources and not amassing of material wealth by a select few.

To summarise, the above considerations lead to the basic principles of non-violence, *aparigraha* (minimizing one’s material requirements) and *achorya* (non- stealing). Humans, endowed with

the highest level of consciousness, have the responsibility of realising their true nature and practicing these principles. Since these are the very same principles which Jainism advocates, we can call Jainism a natural and truly universal philosophy, a code of conduct to be observed by all human beings. This will result in an environment of peace and happiness for all, including animal and plant kingdoms.

Universal laws:

Jainism, as has already been mentioned, classifies the universe in two distinct components — the living and the non-living — and lays equal emphasis on both. Just as physics deals with the physical, material universe, Jainism deals with both, the living and the material universe. Jainism is the science of soul (discussed in Chapters-2, 5 and 6) as well as the science of the physical universe, (discussed in Chapters-7 to 10). According to physics, the universe is governed by certain laws that are universal, applicable at all times and everywhere, cannot be violated and there is no scope for any miracles to happen. When we do not understand a particular phenomenon in terms of the laws of physics, we call it a miracle but the moment it is explained and its mechanism is understood, the miracle ceases to exist. The same is true of living beings. The science of living beings or soul is more complex but, according to Jainism, it also follows certain laws. When we do not understand these laws fully, we invoke God (or destiny), but the moment the phenomena are understood the need for an omnipotent “God” ceases.

Jainism has propounded two basic laws which govern everything, living and non-living, as well as various processes occurring in the universe. These are called *Anekāntavād* (multiplicity of manifestation) and *Karmavād* (causality). Both of these are equally relevant to the physical as well as the conscious (*ātmā* or the self) domains. *Anekāntavād* describes the true nature of the universe and *Karmavād* describes the basic laws which

govern the various processes operating in the universe. *Anekāntavād*, discussed in Chapter-3, implies that the soul as well as matter have multiple properties (termed as *shakti* or inherent power in Jainism), all of which coexist but manifest at different times under different conditions. *Anekāntavād* has been developed to understand both the gross and the subtle nature of the universe. *Karmavād*, the law applicable to the soul (discussed in Chapter-4), is equivalent to the concept of causality in physics. It implies that every action (physical as well as mental, i.e. thought) has a consequence, resulting in creating *kārmic bonds* and every effect that manifests is a consequence of some underlying cause or action. There is no event that occurs without a cause and no action without an associated effect. It is this basic law which governs all the processes of *jīva* as well as *ajīva*. It implies that a soul is at liberty to act in any manner it chooses but cannot escape the consequences of its actions. The consequences of these actions cannot be mitigated by any means, without fully bearing them. We can call it the principle of *kārmic retribution*. The “destiny” is therefore, self made, inevitable and choiceless. In this respect, the Self is the master and not a slave of his own destiny. He is not helpless but must take responsibility for his own actions.

We thus see that Jainism is not a religion in the normal sense of the word. Neither it is a matter of faith nor is it something which ‘God’ has bestowed upon the earthlings, through His incarnations or by sending his messengers for alleviating the misery of the people. It is something beyond religion and faith — it is essentially based on the laws of nature — a path for common people for realizing the laws that govern them. These laws were enunciated by persons, who were ordinary mortals to begin with, but became enlightened by following this path, by their own efforts. Thus this is a well established and documented path.

The important point to remember is that life is governed by some laws, which cannot be violated and does not depend on favor

and fear of an almighty 'God'. Enlightenment is 'understanding' and 'seeing' these laws of nature operating in the universe (on both *jīva* and *ajīva*). Having experienced these laws, one automatically gets rid of all ignorance, fear and attachment. Understanding the laws leads one to observe proper conduct which, in turn, enables one to free the self from the bondage of *karma* and eventually leads to enlightenment.

One has to tread this path by one's own efforts and no one else can be of any help in this journey. It is a difficult path because enormous physical and mental efforts are required to follow it. At the same time it is an easy path because the path is well established, clearly charted and various procedures and landmarks are well defined. One does not have to reinvent it afresh. Any genuine seeker can attain enlightenment by following it. In this sense it is universal. The path that Jainism prescribes for attaining *moksha* or *nirvāna* is valid for all times and, in this sense, it is eternal.

Any religion or *dharma*, which claims to be universal and eternal, must be consistent with the laws of physics, because according to science, only the laws of physics are universal and eternal. They were operative before the universe came into existence and they will control the fate of the universe, even after it dissolves. In fact the birth of the universe was itself a consequence of the laws of physics. We, therefore, make an attempt here to find a scientific basis for various Jain concepts and interpret its basic tenets in the modern context. These laws and their relevance are discussed in the following chapters but we first turn to the central point of Jainism, the Cardinal Truths, related to soul, which are discussed in the next chapter.



CHAPTER-2
The Cardinal truths
(*Ātmavād*)

Appā so paramappā- Bhagavān Mahāvira

- *Nature of soul*
- *Powers of soul*
- *Cardinal Truths,*
- *Interaction of Jīva with Ajīva,*
- *Seven Reals,*
- *Types of Ajīva*

Jainism firmly believes that human beings are endowed with infinite potential and it has laid down procedures to develop this potential fully. *Ātmavād*, or the doctrine of existence of soul, is the ‘cardinal truth’ on which various theories and practices of Jainism are based. Since soul is a formless, non-physical entity, it cannot be investigated by physical techniques generally employed in scientific studies, but its existence can be experienced and inferred from the phenomena and physical effects manifested by it. *Ātmā* has infinite types of powers¹ (*śaktīs*), each having immense influence on both *jīva* and *ajīva* in the universe, by which its existence can be ascertained. We therefore first enumerate some of the powers of soul which can be considered as its properties.

1. *Samayasār* of Kundakunda mentions 47 main powers of the soul. See also Hukam Chand Bharill’s book (47 *Shaktiyan*).

Powers of Soul:

Jainism holds the view that various characteristics of *jīva* and *ajīva* arise from their inherent powers. Similarly for the soul to manifest in infinite ways, its infinite powers come into play. Although all these powers are equally important, four amongst them are considered as primary. These are:

- (i) *Jīvatva shakti*: the power to exist for ever i.e. immortality. Thus every soul is eternal (i.e. *śāśhvata*).
- (ii) *Chitti shakti* (consciousness) or '*anant chaitanya*'. Soul is pure consciousness.
- (iii) *Drishti shakti*: Soul is the viewer, an observer and the one who experiences.
- (iv) *Sarvajña shakti*: Power to know everything (*anant jñāna*, or omniscience).

We may mention six other important powers of the soul, which illustrate its true nature.

- (v) *Anant vīrya* (infinite potency or omnipotence); (vi) *Sarva vyāpakatva* (omnipresence); (vii) *Anant ānanda* (pure and infinite bliss); (viii) *Anekatva* (multi-facetedness); (ix) *Vibhutva* (coexistence of all its powers), i.e. all its *śaktis* coexist as well as manifest simultaneously, at all times; and (x) *Sarva darshitva, samyak darshan* i.e. faculty to have the correct perspective of everything instantaneously.

It may be pertinent here to ask if *ātmā* (soul) really exists, and, if so, can it be established logically? Is there 'something' which bears any one or all of the characteristics of soul mentioned above? Since *ātmā* is a non-physical entity, it cannot be perceived directly by our physical sense organs, so how can it be known? There are only two ways: either its existence can be inferred indirectly by its effects or its powers can be experienced by itself.

Logically, the existence of soul is established by the very act of questioning its existence because questioning presupposes the existence of a “knower”. Since the soul, or the self, alone has the capability of knowing, questioning establishes the existence of soul. Thus the answer to this question is implied in the question itself. Who is asking this question about the existence of *ātmā*? And who will understand the answer when it is given? In fact the questioner and the knower is the soul itself. Thus the *ātmā* is *swatahsiddha*, self proven. The soul is our consciousness i.e. *chaitanya*. The *ātmā* is also the observer who sees. Who can know the knower except the knower himself? “*Vijnataramare ken vijaniyat*”. Therefore, Bhagavan Mahavira said “You can ‘know’ (or ‘see’) *ātmā* (only) by *ātmā*”. The self (*ātmā*) is endowed with the power of manifestation of consciousness which is two-fold, *darshan* and *jnāna*. There is no *jīva* without these two attributes and, in the same way, these two qualities cannot exist without the self. The famous quote of Descartes “*Cogito Ergo sum*”, meaning “I think therefore I am”, conveys the same thing, but refers to the mind. In comparison, Jainism asserts that ‘I know therefore I am’. The term “I” in the above quote refers to the soul. Thus *jnāna* and thought exist because the self (*ātmā*) exists.

We now look at the question of existence of soul from yet another point of view. A human body is estimated to contain about 30 to 100 trillion cells. Though a cell is the smallest living entity which replicates itself, most molecules within the cell are continuously destroyed, remade and replaced. Only enamel of the teeth and cartilage of bones are not replaced. The life span of various cells vary. Sperm cells typically live for three days, red blood cells for about 4 months and white blood cells for about a year. The cell DNA is not replaced but is repaired with new molecules when required and dies with the cell. Whereas brain cells typically last an entire life time and neurons are not replaced when they die, their constituent molecules are replaced over time. So, by and large, all the molecules

of the body are eventually replaced and the dead carbon atoms and other elements, after combining with inhaled oxygen, are exhaled as carbon di oxide etc.

Even though almost all the chemical constituents are replaced in the body, the sense of identity of the 'self' persists. Thus the self is not the body and there is something beyond the body which gives the continuing perception of the self. That Jainism calls *ātmā*.

We look at this situation in the context of Theseus paradox of ship which is stated as follows. 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 formulated about 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), is the ship B the same as A or different? Again the opinion is divided and one can break the problem down into various perspectives: material, utility, appearance etc. Much before Theseus paradox was conceived, the problem was formulated during a Buddhist discourse on rebirth. "Is the person who is reborn with a totally new body, the same as the one who died, with the old body completely destroyed, or different?" Nagasena replied "Neither the same nor different". When a lamp is lit for the whole night, the flame is not the same throughout. It changes from moment to moment. In effect, it is cessation of one and creation of another, while the 'essence' remains the same¹.

Ātmā can exist both in pure (free of bondage) state as well as in bonded state i.e. as *jīva*; in the pure state it becomes *paramātmā* and acquires the powers of infinite *jnāna*, *darshan*, *ānanda* and

1. The answer to these puzzles can be found within the frame work of *Saptabhangi*, discussed in Chapter 3. 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.

virya. These four attributes are called “*anant chatusthaya*”. *Ātmā* is *Anādi* (i.e. it has been in existence since time without beginning), *Anant* (without an end), *Amūrta* (formless), *Avināshī* (indestructible), *Anant pradeshī* (infinite or immeasurably large in expanse), and *Akhand* (indivisible). By virtue of its power of indivisibility i.e. *akhandatva*, it is *ati-sūkshma* (smaller than the smallest). In addition to these qualities *ātmā* has some ‘ordinary’ properties as well; like it has *astitva* (existence), *dravyatva*, *vastutva*, *prameyatva*, *aguru-laghutva*, etc. It is considered to be the knower who can perceive without the help of sense organs; i.e. it is super-sensuous (*atīndriya*). In the pure state *ātmā* is free (unbonded), *nirapeksha* (absolute, without any attachment), *swāshrit* (self-supporting i.e. independent), *achal* (motionless or vibration free), *nisang* (without company, alone and independent), *jñāpak jyotirmātra* (*self-illuminating*). It is not affected by time i.e. does not undergo the process of aging, has the property of timelessness (*Akāl*). Although we can go on narrating other powers (or characteristics) of *ātmā* which are infinite in number, the above narration should suffice to illustrate the large variety of its inherent powers.

One question that often comes to mind is whether the soul has material or non-material nature. In pure state, the soul is non-material but owing to its power of *dravyatva*, it can assume material form as well, as happens when it is in a bonded state. When subtle *karmāṇus*, which are made of fine material particles (*pudgal*), get attached to a soul, it becomes capable of performing vibrational motion and jiva is formed. As far as we know, only physical entities can have vibrational modes. Thus in its bonded state, *ātmā* assumes material form and exhibits vibrations. The type of *jiva* that is formed depends on the type of vibrations. Albert Einstein has shown that matter can be converted into energy and vice versa, through his famous equation, $E=Mc^2$. Thus scientifically, non-corporeal can be converted into corporeal and vice versa. Likewise, when all the

karmāṇus are completely detached from the soul, it becomes pure and again acquires non-material form, i.e. becomes self luminous energy. Several oriental philosophies invoke the existence of soul but their views on the nature of soul are not identical, which is expected in view of its property of *Anekatva* (multiple manifestation or multi-facetedness). According to *Saptabhaṅgī* (Jain concept of seven modes of predication, discussed in Chapter-3), everything exhibits seven modes, and may simultaneously exist in multiple forms, of which some properties may be *avyakta* (unmanifested and indescribable). Accordingly, one can say that (i) soul is in material form (e.g. when bonded with *karmāṇus*), (ii) it is in non-material form (e.g. when free of bondage), (iii) it has material form but is inexpressible, (iv) it has non-material form and is not expressible, (v) it is neither material nor non-material, and is inexpressible (vi) it is both, material as well as non-material, and (vii) it is both, material and non material and is inexpressible. This is similar to the concept of quantum mechanics in which elementary particles, the ultimate constituents of matter, may occur either as particle or wave or both, the concept known in quantum mechanics as the wave-particle duality (discussed in Chapters- 3 and 7). Following these considerations, the soul may assume either material or non-material, or both or none of these (i.e. indescribable) forms.

Many qualities are ascribed to *ātmā* in the scriptures of Jainism, Hinduism and Buddhism. Buddhism also propounds the existence of *chitta* but Gautam Buddha had refrained from entertaining any discussion on this issue in his discourses, because soul is indescribable. Thus it is obvious that the nature of soul is a highly contentious issue. Both materialists and spiritualists accept only one primary cause of the universe, either matter or soul. Scientists hypothesize that “living” can emerge out of “non-living”, whereas some spiritualists believe that all matter is essentially a manifestation of the self (*ātmā*). It is, however, not clear how either

of these two claims can be substantiated. To resolve this issue, some dualistic theories have been proposed which consider both mind (*purush*) and matter (*prakriti*) as two eternal, interacting, and coexisting yet independent entities. There is a two-way psycho-physical interaction between mind and matter – from mental to physical (as e.g. a thought in mind can lead to action by the body) or from physical to mental (as e.g. a physical action leading to mental perception). Thus even a mere thought in mind to perform a certain action can initiate physical action by the concerned part of our body. This implies that the self is present everywhere in the body, a property called *niyatpradeshatva shakti* that characterizes the *ātmā*.

According to Jainism, the universe involves constant interplay between *jīva* and *ajīva*. The soul and *karmāṇus* interact with each other but maintain their individual, inherent, core qualities. Jainism clarifies that *jīva* cannot be converted into *ajīva* and vice versa, a quality known as “*agurulaghutva*” (individuality) which maintains their separate identities in their respective forms although they can interact and merge with each other into an aggregate. Jainism considers both matter and *jīva* as *astikāya*. Both are real (*sat*: “*Utpād-vyaya- dhrauvya- yuktam sat*”). Every action by *jīva* results in a psycho-physical entity called *kārmaṇ sharīra*, a bonded state, in which the soul exhibits vibrations.

Jīva, like matter, is *astikāya*, but unlike matter that offers resistance to other material particles for inhabiting the same space, soul occupies the dimension of the body but does not bar other souls to occupy the same space, i.e. it does not fill the space exclusively. Two or more souls can occupy the same space together, just as two lamps can simultaneously illuminate the same space. Thus co-existence and co-presence are two of the characteristic qualities of the soul. One of the qualities of the soul mentioned in Samayasara is *vibhava shakti*, (power of distortion) which enables soul and matter to influence each other by mutual

interaction, without losing their individual, innate qualities. *Ātmā*, also interacts with *karmāṇus* (material particles) after which both evolve independently in their respective ways. Such an interaction leads to bondage of soul. There is no bondage without interaction between *ātmā* and *karmāṇus* and there is no interaction without bondage of the soul. There are two types of bondages: mental and physical, called *bhāva karma* and *dravya karma* respectively. *Bhāva karma* is the spontaneous transformation of the self by itself and *dravya karma* is transformation of the self through physical action.

The existence of soul and its eternal nature are the two cardinal truths of Jainism. These constitute the theoretical foundation of Jain philosophy. Now we discuss the practical aspects of Jain philosophy which are based on four additional “truths”. Thus there are six cardinal truths, in all, as follows.

The Six Cardinal Truths¹:

1. The soul exists.
2. Soul is eternal (*shāshvat*), without beginning or end. It is indestrucible.
3. Soul is the *kartā* (doer), i.e. it can make a choice and act accordingly i.e. indulge in *karma*.
4. Soul is also the *bhoktā*: soul has to bear the consequences of its actions i.e. *karma*.
5. Attaining *moksha*: The soul can achieve its pristine (pure) state by becoming free from bondage.
6. Procedure for attaining *moksha*: There are specific procedures and practices for purifying the soul.

1. The six cardinal truths mentioned here are based on *Āmasiddhi* written by Srimad Rajchandra, believed to be originally described in *Drishitivād*.

When one has developed resolute, unwavering faith in these six cardinal truths, one achieves correct perspective of life or correct world view (*samyak darshan*). Equipped with *samyak darshan* and by following various procedures laid down for purification of the self (Chapter- 6), one can acquire perfect wisdom (*samyak jñāna*) and perfect conduct (*samyak chāritra*). Everyone has a different perspective of the world, which depends on one's own *kārmic* vision (*karma drishti*). Our comprehension is limited by the extent to which our *kārmik* vision enables our sense organs to perceive things around us. Furthermore, the sense organs of living-beings have inherent limitations. This is why humans and animals perceive the world differently. Even different human beings have different perception of the world, which depends on the inherent capabilities of their own minds and other sense organs, dictated by their *kārmic* vision. As *karmas* get progressively eradicated, one gradually acquires correct perspective (*samyak darshan*) of everything. When all the *karmas* are eradicated completely, the mind which is dependent on the sense organs, also dissolves and the super conscious mind becomes active. Getting rid of the ignorance with correct vision (*samyak darshan*) leads one to attain *samyak jñāna* and by following it in thoughts and acts (*samyak charitra*), true wisdom (*sambodhi*) is achieved.

The universe is populated with infinite number of souls. There are two main reservoirs, *Nigoda*, having the lowest form of life (with only one sense of touch), where the journey of life begins and *Siddhashila*, the abode of *Siddhas*, where the pure, enlightened souls find their final resting place. These will be further discussed in Chapter-10.

The Seven Reals:

There are seven (and only seven) '*reals*' or *tattvas* which are vital from the point of view of the soul. These are: *jīva*, *ajīva*, *āsrava* (inflow of *karmāṇus*) which lead to bondage of soul, *saṃvar* (stoppage of bondage with *karmāṇus*), *nirjarā* (cleansing

of soul by elimination or detachment of *karmāṇus*), and *moksha* (liberation). Basically the last five of these *tattvas* are related to interaction (association and dissociation) of *jīva*, i.e. of the sentient soul with the material *karmāṇus*. *Jīva* is an active *tattva*, being *kartā*, capable of acting on its own, and endowed with various powers mentioned above. *Ajīva*, as already mentioned, is an independent *tattva*, comprising five constituents: space, matter, time, *dharmāstikāya* (facilitating motion), and *adharmaṣṭikāya* (facilitating rest). These five constituents are essentially passive (i.e. incapable of performing any action on their own), independent, all pervading, coexisting, indestructible, and incapable of influencing each other. According to Jainism they, together with *jīva*, constitute the physical universe. These five *ajīva* entities pervade the entire universe and the domain of their influence defines the physical boundaries of the *loka* (universe). The *loka* is located in an infinite *aloka* which is devoid of the last four entities, i.e. only made up of space whereas matter, time, *dharmāstikāya* and *adharmaṣṭikāya* do not exist there.

Interaction of soul and matter constitute the most vital aspect of Jainism. This interaction, both association and dissociation, occurs through *karmāṇus*, the subtle particles of matter. When soul acquires *karma*, a physical body begins to take shape. Normally, every *jīva* has three bodies viz. *kārman*, *tejas* and *audārik* bodies and two additional bodies, *āhāra* and *vaikriya*, can be formed under specific situations. These five bodies can be translated respectively as causal body, energy body, physical body, translocation body, and transformation body. The *kārman* *śarīra* is receptacle of *kārmic* matter and is formed as the soul acquires *karmāṇus*. It changes from moment to moment as the *karmāṇus* are either assimilated with the soul or are shed by it. When the soul sheds all the *karmāṇus*, it acquires a sublime state and becomes free, pure and liberated. At the time of death, the *kārman* body accompanies the soul and forms the seed of a new body that is

acquired on rebirth. The *tejas* body consists of energy (energy *pudgals*) and helps in maintaining the body metabolism. *Audārik* body is the gross physical body of all living beings, including animals and humans. *Āhārak* body is the conscious body (*chetnā* which transforms experience into wisdom or *jnāna*) and grows as knowledge is acquired. It gets activated during the process of learning and enables one to acquire the correct perspective of life. *Vaikriya* body can change its form as well as dimensions and thus can bring about transmigration of soul into different bodies. Thus, *kārman* (causal), *tejas* (energy), *āhārak* (conscious), *vaikriya* (multi-shaped), and *audārik* (physical), bodies represent the sequence from subtle to gross bodies of a *jīva*. The eternal nature of the soul implies rebirth after death. Even though the physical body ‘dies’, the journey of the soul continues eternally. As mentioned before, the soul is likened to a flame of an oil lamp (*diyā*) which continues to be lit through the night but the flame which gives the first light is not the same as the next. It changes every moment. So is the consciousness; it changes every moment. Consciousness in the new existence is neither exactly the same as in the previous birth nor entirely different, but there is continuity of essence between them.

In this Chapter the powers of soul and various aspects of interaction between *jīva* and *ajīva* have been summarized. Since the universe involves constant interplay between *jīva* and *ajīva*, it may be pertinent to understand the true nature of the universe, as described by *Anekāntavād*, and the laws governing the interactions of soul and matter, as described by *Karmavād*, that form the subject matter of the next two Chapters.



CHAPTER-3

Theory of Multiple Manifestations

(*Anekāntavād*)

One is many and many is one.

➤ *Nature of the universe*

➤ *Macro- and micro-world*

➤ *Syādvād*

➤ *Saptabhangī*

Jainism has given a profound conceptual doctrine for the nature of things, both living and non-living, called *Anekāntavād*, which is quite unique. It states that everything in nature is multifaceted, characterized by infinite modes, which coexist in everything, but manifest at different times under different conditions. This concept of multiple manifestations is not found in any other philosophy. Whatever we can think of, see or imagine has multiple facets; some of these may *prima facie* seem to be at variance and even mutually inconsistent but together they provide a complete description of its real nature. In Jain view of *anekānta*, nature of everything is varied, variegated and encompasses all its aspects in past, present and future. There can be multiple ways, views and approaches to comprehend reality. Each view is incomplete by itself but different views complement each other and, together, they give a more wholesome understanding of reality. However, it is not possible to describe any object, living or non-living, completely because the number of modes in which a given

‘thing’ can exist are many, very large or even infinite. Āchārya Amritchandra described *Anekāntavād* as follows —

“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 (*abhilāpya*) and indescribable (*anabhilāpya*), neither this nor that, but both, i.e. this as well as that, in terms of its nature, time, space (*pradesh*), material and mode (*swarūp, kāl, kshetra, dravya and bhāva*)”.

Nothing in the universe, except the *ātmā* and *paramāṇu*, is pure and everything else is an aggregate (*skandha*) of two or more elements. Every constituent of every aggregate behaves differently under different conditions and therefore, their combination manifests multiple characteristics, depending on the conditions. A simple example is the combination of *ātmā* and *karmāṇus*, which result in a large variety of *jivas*. Consequently, all objects in the universe possess a large number of modes of existence (*paryāya*).

One may visualize a given thing or situation from any one stand point or perspective (*naya*). There are several *nayas* such as *vyavahār naya* (practical view), *samagra naya* (holistic view), *rijuṣhtra naya* (current view), *naigam naya* (end use), *shabda naya* (synonymous view), *samviruddha naya* (etymological view), *evambhūt naya* (simile) and *nischaya naya* (definite view). To these *nayas* can be added philosophical view, scientific view and other views. Each of these views holds good only in a limited context, i.e. these views are valid under certain conditions and do not describe a particular thing or situation in totality or in all its aspects (in the past, present and future) or in an absolute sense.

In view of the above discussion, *anekānta* has been variously interpreted as the theory of many-foldedness, multi-facetedness, multi-sidedness, multi-layered, multi dimensional, multi-perspective view, contextuality, pluralism, co-existentialism, non-absolutism, non-equivocality and relativism. S. Mookerji 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. *Anekāntavād* successfully takes a holistic and synergetic view, assimilates them and establishes harmony between the various view points. Considering them together in totality gives us a more complete description of the true aspect of reality.

Thus, according to *anekānta*, each standpoint should be considered only as partial truth that holds good in a particular context and different contexts or perspectives serve as different frames of reference. As in the Special Theory of Relativity, the perceived parameters of motion depend on the frame of reference of the observer, relative to which the motion of the object takes place, so is the case with the perceived nature of things, which depend on the perspective (or the mental frame of reference) of the observer, which is subjective. To extend the analogy further, as envisaged in the Einstein's Theory of Relativity, time and space (and motion) are not absolute, so also in *anekānta*, the nature of a thing is not absolute but relative. For this reason, in Jain philosophy *Anekāntavād* is termed as relativism. Furthermore, when any of these *naya* propositions or standpoints are stated categorically with certainty, i.e. "this is it" and is claimed to be absolutely true, in real terms, the statement turns out to be false. Sometimes *Anekāntavād* is contrasted with *ekāntavād* (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.

Anekāntavād can be practically demonstrated through a Buddhist anecdote as follows. "A Buddhist monk was approached by the Chinese king who lamented that the Buddhist philosophy is very complicated and asked the monk to explain its essence in a simple way. The monk sought a day's time during which he

covered all the sides, floor and ceiling of the hall with mirrors at various angles and installed Buddha's statue in the centre. The mirrors reflected infinite views of the Buddha. Next day he invited the king to see for himself and explained "The essence of Buddhism is that the whole universe is a reflection of the Self (Buddha mind)". This anecdote vividly demonstrates the philosophy of *anekānta*. One gets infinite views of the same reality, depending on angle from which one perceives it. Furthermore, not all the views can be seen simultaneously, at a given instant of time. This is the essence of *anekānta*.

Anekānta is not merely a doctrine but a physical reality, a true and complete description of nature of things. In contrast, science gives only a partial description of objects depending on the particular property of the object being studied and the technique employed for observations. Yet, to understand the principle of *Anekāntavād* scientifically, we take recourse to quantum physics. As will be discussed in Chapter-7, it has been shown experimentally that a photon (or electron or any elementary particle) sometimes behaves as a 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. Furthermore a photon manifests 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 "entity", what is called a particle or a wave at different times.

Macro- and micro-worlds:

Quantum physics divides the universe into two parts, the gross (macro) and subtle "micro" (Figure-7.1). The macro world (galaxies, planets, rocks, dust and the objects that can be seen with unaided eyes) is governed by laws of classical physics. The micro-world (atoms, elementary particles etc. that cannot be seen without employing a high power magnifying device, such as an

electron microscope) is governed by the laws of quantum mechanics. The laws governing classical and quantum physics are quite different, as discussed in Chapter-7.

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 and shape. Even though the matter is made up of protons, neutrons, electrons etc. their existence cannot be perceived directly in gross state. When 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 at any given instant, 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 the Jain concept of matter, as we go down in size, *paramāṇu*¹, the smallest particle of matter, 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 (consciousness) of the observer, but is due to the inherent nature of things which forbids them to manifest all their properties simultaneously at a given instant of time. A complete description and understanding of the true nature of an entity requires consideration of all of its attributes that represent the manifold aspects of its existence (*pariyāya*).

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1. In spite of the same name the Jain *paramāṇu*, which is the smallest unit of matter and is dimensionless, is not the same as the *paramāṇu* (atom) described in modern physics.

***Anekāntavād* and the principle of Complementarity:**

Scientifically, the closest approach to understand *Anekāntavād* is the “principle of complementarity”, which is a cornerstone of modern physics. Complementarity is quite a revolutionary and significant concept in quantum physics. Neils Bohr, who



Figure- 3.1: Schematic representation of the principle of complementarity, indicating that in reality opposites are complementary based on the Chinese concept of Yin and Yang. The two fishes in the diagram are opposite in all respects (color, eyes, direction etc.) but both together are essential for obtaining the complete picture. This was used as an emblem by Neils Bohr to describe some apparently contradictory phenomena in quantum mechanics.

propounded the basic principles of quantum mechanics, had difficulty in explaining the behavior 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 common sense since it was presumed that a photon or an electron should either behave like a material particle or as a wave but not both. Bohr explained this seemingly contradictory behavior by stating that it reflects complementary

aspects of their true nature. He used the Chinese concept of Yin and Yang (Figure- 3. 1), which have opposite characteristics (color, orientation, eyes etc. of the fishes) but coexist and both are required for the sake of completeness. *Anekāntavād* goes a step further and states that it is not just the duality (such as the particle and the wave nature manifested by the elementary particles) which needs to be explained but many (*anek*) or even infinite modes of behavior, which are manifested when one goes down to progressively more subtle, smaller constituents of matter and ultimately to the level of the indivisible *paramāṇu*. As mentioned in the previous Chapter, soul is indivisible (*akhand*) and hence it is the subtlest of all the entities that exist in the universe and, according to *Anekāntavād*, should have infinite attributes.

Anekānta not only accommodates apparently contradictory propositions encountered in daily life but takes a synergetic view of philosophy, micro-world, mental perception and spiritual aspects. 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, *anekānta* emphasizes that some of the aspects can be indescribable or inexpressible. Questions which cannot be answered unambiguously, either in the affirmative or negative, such as the nature of soul, can be dealt within the framework of inexpressibility. In essence, *Anekānta* is a multi-view perception theory which does not arise due to limitations of sense organs or consciousness to perceive various aspects of the physical world completely, but represents the true behavior of things.

Anekāntavād has many corollaries for its practical application and we discuss two of them, *Syādvād* and *Saptabhaṅgī* here.

***Syādvād*:**

Syādvād is based on the premise 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

(*avyakta*). In other words, one can state that all aspects of reality are contextual and there is no unique, absolute, complete truth and some element of truth always remains latent in every manifestation (proposition) of reality. One may be closer to the truth when one qualifies a particular perspective by stating that *perhaps* this perspective too may be correct. It does not, however, imply any doubt, confusion, ambiguity, or uncertainty but makes our understanding as certain as it can be. Since all propositions are contextual, the only statement one can make with certainty is that no proposition is absolutely certain. This is the way in which one can define *Syādvād* or the Jain Principle of Uncertainty. This, however, is different from the Heisenberg's Principle of Uncertainty in physics, discussed in Chapter-7. It is not "*Sanshayavād*, a doctrine of doubts, but defines the limits of certainty which can be assigned to any statement.

Science has its foundation rooted in knowledge, a part of which is known and the remainder is unknown at the moment. When an appropriate scientific study is conducted, part of the unknown becomes known and eventually nothing remains unknown and everything becomes known. In contrast, Jainism propounds that knowledge has three components: known, unknown and unknowable (Figure 3.2). Unknown can become known by a scientific study but unknowable can never be known, at least by sensory organs. It can only be experienced. Thus according to *Syādvād*, there is limit to knowledge. Similarly every law has two components: one which can be described or mathematically formulated and the other, latent aspect, which can not be formulated. The moment we express any law mathematically, the other part is automatically lost. Scientifically, mathematical formulation brings in precision but according to *Syādvād*, the inexpressible part is lost when it is formulated or described, resulting in loss of information. This is similar to Godel's Incompleteness theorems and has been discussed by Bhandari and Pokharna (2014).

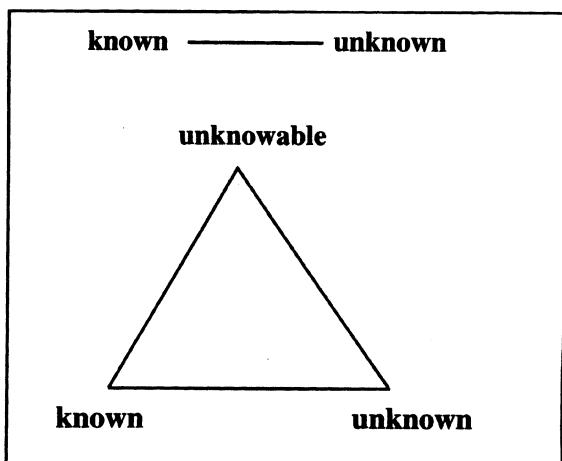


Fig 3.2. Science view of knowledge having two components, known and unknown, represented by a liner relation (above). Any object lies somewhere on this line. This view is compared with the Jain view of complete knowledge of any object which has three components, known, unknown and unknowable (bottom figure). Any object is located somewhere in this triangle. The knowledge of an omniscient kevali lies at the bottom left corner of this triangle, where everything is known, and nothing is unknown or unknowable about the object.

Saptabhangī, Seven states of predication:

Saptabhangī states that every “thing”, living or non-living, can exhibit seven modes of manifestation. These seven modes are :

1. It exists (*sat*) in a particular state.
2. It does not exist in that particular state (*asat*), but may be in another state.
3. It exists in a particular state and is indescribable (*sat and avyakta*).
4. It does not exists in that particlar state and is indescribable (*asat and avyakta*).
5. It is in neither of these two states.
6. It is in both the states.
7. It is indescribable (*avyakta*).

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 *Saptabhangī* 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 merely a particle (indeterminate); it is a wave and yet it is not just a wave (indeterminate); it is neither a particle nor a wave; it is both, a particle as well as a wave; and its state is indeterminate. This has been succinctly explained by 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 (say A and B) by a partition with a hole in it. In accordance with the particle-wave duality, the particle (say, a photon or an electron) can either be in compartment A, or in compartment B, in A and still not only in A, in B and still not only in B, neither in A nor in B but somewhere outside the box, in A as well as in B and in an indeterminate state (*avyakta*). The same scenario emerges from quantum mechanical considerations, as has been shown mathematically by considering wave functions that describe the behavior of a particle.

Thus *saptabhangī* introduces the concept of indescribability (*avyakta*) which states that some of these seven states are indeterminate. This is conceptually similar to Tao Te Ching, propounded by the Chinese seer Lao tzu, who declared that the 'Truth' can not be described and what is described is not the 'Truth'.

This concept of *avyakta* is scientifically somewhat intriguing as it implies an indeterminate, indescribable or unmanifested state. Science, so far has been dealing with a binary system : 'yes' or 'no'; either a thing exists or it does not exist. Scientific logic, deductions, probability theory and statistics are based on only these two options. The probability of a point A being at a place x is

either 0 or 1 (it is either there or not there) according to classical physics and any value between 0 and 1, according to quantum physics. But according to *Saptabhangi*, there are seven possibilities, all with finite probabilities. This appears more realistic from our daily experience since some times we get exactly the desired result from our efforts, some times not, some times we get an altogether unexpected result and sometimes a combination of these three (Bhandari and Pokharna, 2014). Logical framework and probability theory have been developed from these possibilities (Ramachandran, 1982, 1983; Mahalanobis, 1957; Jain, 2011; Haldane, 1957). Thus we find that the concepts of limits of knowledge, probability and statistics are ingrained in *Syādvād* and were known at least for the past 2600 years, since the times of Mahavira. The Medaeval Indian logic was based on this concept, but was largely forgotten till its recent revival by various scientists, mentioned above.

In a nutshell, *Anekāntavād* emphasizes that any perspective is true (but only partially) and another perspective is also likewise partially true; thus there is no scope of any conflict between the two views. Contrasting it with the *Upanishadic* concept of *neti*, in which the Brihadaranyaka Upanishad looks for the existence of God in every conceivable object and arrives at a negative conclusion i.e. “Neti, Neti”, implying (that God is) “neither this, nor that”; in fact, none of the visible objects is God. In contrast, *Anekāntavād* asserts it in the affirmative “This is true and that also is true”.

Three different doctrines have been propounded in various oriental thoughts: *advaitavād* (non-duality or monism), *dvaitavād* (duality) and *Anekāntavād* (innumerability). The universe consists of an infinite variety of things. The first proposition (monism) implies that everything we see around has emerged from ‘one’ (*ek*). Thus *advaitavād* (literally meaning “non-duality”) implies that everything is a manifestation of “one”. Thus if in the beginning

there was only “one”, logically “many” (*anek*) can not emerge from “one” because, according to causality, for anything to materialize requires a cause. Without a cause ‘one’ would remain as ‘one’ for ever. Therefore, many coming out of “one”, without a cause, violates the principle of causality (Chapter-4). Causality requires existence of something more than one (i.e. at least “two”) to interact with each other and give rise to “many”. This proposition rejects “*advaitavād*” (non-duality) and necessitates the concept of “*dvaitavād*”. In the latter case, everything emerges from the interaction of *purush* (conscious being) and *prakriti* (matter). *Anekāntavād* goes a step beyond this. It emphasizes that the “one” has infinite attributes and thus one and many become the same. Thus *anekānta* offers a true and complete description of the physical reality.

Besides understanding the true nature of “things”, conceding that all views have some element of truth, *Anekāntavād* has been widely and successfully applied in day to day life for understanding and harmonizing diverse, often mutually contradictory, personal, domestic and societal issues and also philosophical and spiritual views. Much has been said and written in the praise of *Anekāntavād*. Understanding of *anekānta* is essential for attaining correct perspective in life as well as world view, or *samyak darshan*. The Jain scriptures state that those who are endowed with *anekānta* are liberated from the cycle of death and birth and attain *moksha*.



CHAPTER-4
Karmavād
(Causality)

*One who believes in karma can do no
wrong and can never be unhappy.*

- *Types of karma (bondage)*
- *Fructification and Eradication of Karma*
- *Āshrava (inflow), Bandh (bondage),
Samvara (protection), Nirjarā (cleansing),
Moksha (liberation)*

The physical processes occurring in the universe involving matter follow the law of causality which states that “Every action results in an effect and no effect manifests without a cause”. This law of causality applies to all sentient beings and constitutes the *Karmavād* of Jainism as well as some other oriental religions. Every physical action affects both the body and mind and every mental action or thought process affects the mind and has a subtle, yet perceptible, effect on the body. Both, physical activity and mental thought affect the soul but the consequences of *bhāva* (thought or attitude) on the soul are severe. Every physical action (*dravya karma*) or thought (*bhāva karma*) results in creating bondage of the soul. In any given situation, one is free to act in any manner one desires but there is no choice in facing the consequences of the action because the law of causality, which applies equally to everyone, is strict and cannot be violated under any circumstances.

An important corollary of *Karmavād* is that there is no scope for coincidences or miracles to happen. Every event that manifests in one's life is in strict accordance with the law of causality. Thus coincidences, good or bad fortunes and destiny are consequences of one's own accumulated *karmas* in the past. The effects of *karma* not only create obstructions and delusions in acquiring the right world view, wisdom and conduct, which are necessary for attaining *moksha*, but also determine the type of species (*yoni*) in which one will be born in the next birth.

Since every mental as well as physical action results in the corresponding *karma bandh* (bondage), there are infinite types of *karmas*. The various *karmas*, in accordance with the effects manifested by them, have been classified into eight major categories.

1. *Jnānāvaraṇīya* (wisdom veiling) *karma*: It blurs the faculty of acquiring true knowledge or wisdom (*samyak jñāna*) which enables one to choose the right path, develop right perspective and observe right conduct, all of which are essential for attaining *moksha*. The right path is the path of truth and understanding of the laws that govern the universe such as *Karmavād* and *Anekāntavād*. The right perspective is to realize the mutual interdependence of all living beings. The right conduct, determined by the right perspective, involves observing total non-violence, in thought, deed and speech. By observing these practices, *jnānāvaraṇīya karmas* are eradicated and one acquires *manah-paryāv-jñāna*, a step towards ultimately gaining *keval jñāna* (omniscience).
2. *Darshanāvaraṇīya* (perception veiling) *karma*: It blurs the faculty of right perception by the sense organs as well as by mind and also adversely affects the power of extrasensory perception. If one has perceived the existence of soul, believes in the six cardinal truths (Chapter-2) and conducts oneself in accordance with the procedures laid down for purification of soul (Chapter-6), one gets rid of this delusion. Gradually one

develops insight into *Anekāntavād* (Chapter-3), understands the true nature of the universe and attains *samyak darshan*.

3. *Mohanīya* (attachment) *karma*: This *karma* is acquired due to attachment to worldly possessions and sensual pleasures. Through such an attachment (*moha*), one develops negative traits, such as anger (*krodha*), pride or ego (*ahankār*) and greed (*lobha*), leading to loss of the wisdom which is required to observe right conduct. In practice, it is difficult to completely win over *krodha*, *moha*, false pride and *lobha*. A realistic approach, therefore, is to replace these negative traits by positive qualities of *kshamā* (forgiveness), *saralātā* (simplicity), *vinaya* (humility) and *santosh* (contentment). When such qualities, especially compassion and forgiveness towards all living beings are realized, one achieves complete detachment from worldly possessions whereby the effects of *mohanīya karma* are eradicated and the soul becomes free of delusions.
4. *Antarāya karma*: It arises due to harboring ill will towards others or by obstructing others from doing noble deeds, which results in creating obstacles in accomplishing the desired goals. This *karma* is eradicated by wishing well being of every one and also by encouraging and facilitating others to do good deeds.
5. *Āyush karma*: It determines the life span of a person in the ensuing life. One can increase or reduce his/her lifespan, to some extent by one's own efforts.
6. *Nāma karma*: It determines the personal traits of a *jīva*, like physical appearance and health, in the next life.
7. *Gotra karma*: It determines the *yonī* (species), family, social status etc. in which a *jīva* will be reborn.
8. *Vedanīya karma*: It determines an individual's capacity to withstand extreme pain or pleasure. When one has mastered one's own mind, always remains calm and composed and becomes detached from worldly affairs, this *karma* is eradicated.

Each of these *karmas* is further divided into many sub-groups, but without elaborating on these divisions further, we would like to state that there are certain procedures for eradicating the consequences of various types of *karmas* (discussed in Chapter-6). Each of these *karmas* is acquired in three ways: by physical deeds, thoughts, and passive acceptance (*anumodan*) of actions performed by others. Therefore, one must not only refrain from committing any wrong doing oneself (and not even think of doing so), but also refrain from passively accepting or encouraging any wrong doing by others.

Any action, good or bad, results in bondage of the soul which poses a hindrance in attaining *moksha*. The consequences of different types of actions cannot be annulled by each other. Thus the positive effect of a good *karma* cannot be offset by the negative effect of a bad *karma* of equal magnitude, or vice versa. On the contrary, the consequences of all types of *karmas* have to be borne individually and stringently, in full measure without any reprieve. The consequences of good and bad *karmas* cannot be annulled and one has to, therefore, face the consequence of each *karma* separately. Eradication of both, good and bad, types of the binding *karmas* leads to liberation which is the ultimate goal of human life. Only when the bondage created by good as well as bad *karmas* (both *dravya karma* and *bhāva karma*) are completely eradicated, one attains the state of perfect bliss (*nirvana*).

The best way to eradicate the adverse consequences of a bad *karma* is to undergo its *kārmic* retribution ungrudgingly. The realization that one has to inevitably bear the consequences of one's actions, sooner or later, should serve as a deterrent to commit even a minor wrong doing. The realization that the unfavourable situations in life arise from one's own accumulated past *karmas*, which cannot be expiated either partially or fully without going through their consequences, provides one with the necessary

mental resolve to face them without the associated mental suffering. Because of the realization that one has to inevitably face the consequences of every deed and thought, one who firmly believes in the principle of *kārmic* retribution, can do no wrong. The realization that whatever manifests in one's life is a result of one's own past *karma* and no one else is responsible for it, leads one to achieve a state of equanimity in all situations.

Karma has consequences at various levels – physical, mental, as well as subconscious – which lead to bondage of the soul. The spiritual stage or the *Guṇasthān* of the soul (Chapter-5) depends on one's accumulated *karmas* over all the previous lives as well as in the present life. Upon death, the soul gets detached from the physical body, leaving behind all the material possessions on the Earth itself. The only thing the soul carries with it is one's good and bad *karmas* in the form of *kārmaṇ sharīra*. It, therefore, follows that no one, not even the omnipotent Tīrthankaras, or 'God', can protect one from the consequences of one's good or bad *karmas* or bestow some boons *gratis* to offset the consequences of one's *karmas*.

Of the eight groups of *karmas* described above, the first four are of destructive nature (*ghāti karmas*) and the remaining four are non-destructive (*aghāti karmas*). *Ghāti karmas* affect the soul whereas *aghāti karmas* affect only the physical environment and worldly traits of a living being. The soul inherits both good and bad *karmas* when it opts for a body at the time of birth. These constitute two repositories, viz. *sanchit karma* and *arjit karma*. *Sanchit karmas* are accumulated over past lives and *arjit karmas* are acquired by actions done in the present life. Thus *karmas* are cumulative and the *kārmaṇ sharīra* keeps on accumulating the consequences of each action, good or bad, done in previous lives.

We must realize that no one can exist in this world without any physical or mental activity. Avoiding *karmabandh* does not mean that one should sit idle and refrain from any activity. The

question that naturally arises is: “how does one involve in an activity without creating bondage of the soul?” Is *karma*-free action possible at all? This indeed is possible if one acts in a detached manner, without having any expectations or returns, material or spiritual. In other words, one does not accrue any *karma* when one acts dispassionately. The path or procedure to attain this state is by following the principle of *samvara* (which rids one from acquiring new *karma*), and *nirjara* (shedding of old *karma*).

The consequences of some *karmas* manifest instantaneously while for others, their consequences are delayed. The reason for this is inherent in the principle of *kārmic* retribution which is very strict and one has to invariably experience the consequences of all *karmas*, good (*punya*) as well as bad (*pāp*), without any reprieve or remission. Consequently, the fruition of *karma* occurs only when the right conditions or situations are encountered in one’s life. This may require a number of combinations of circumstances, such as presence of all the concerned *jiva*, the type of joy or suffering, pleasant or unpleasant situations, which cumulatively result in just the right conditions to occur. Sometimes, appropriate conditions may occur in one’s present lifetime itself for the consequences of *karmas* to manifest. On the other hand, in some cases, it may take a finite time, or even several lifetimes (rebirths) till the right conditions are encountered, in which case the *kārmic* manifestation may be delayed. In the intervening period, the *karmas* remain dormant which explains the apparent lack of one to one or instantaneous correlation between one’s deeds and destiny. Some persons seemingly enjoy good fortune even while being engaged in sinful activities and the reverse is also true i.e. noble deeds do not instantaneously result in happy situations. While the *karmas* remain dormant, they do not cease to exist. Their effects manifest whenever appropriate life conditions or situations arise.

The formation of different types of *Karmāṇus* by thoughts and deeds, good and bad, their attachment to the soul, formation

of *kārmaṇ sharīra*, and their detachment from the soul by meditation, penances etc. and the consequent purification of the soul are processes of vital importance in Jainism. These processes are not understood but, none the less, it is desirable to make an attempt here to see how these subtle processes may work from the point of view of Jainism as also from our current scientific knowledge of processes operating in the body, mind and brain.

According to Jain philosophy, *karmāṇus* are the carrier particles of *karma* and are believed to be made of *pudgal* i.e. matter. *Karmāṇus* get attached to the soul and create the *kārmaṇ sharīra*, which covers the soul like a veil and impurifies it, reducing it's inherent powers. It may be noted that *Karmāṇus* are *karma*-specific, i.e. each *karma* has its corresponding *Karmāṇu*. Therefore there have to be infinite types of different *Karmāṇus* for the infinite types of thoughts and deeds, a human is involved with. Their nature, structure, the mechanism by which these extremely fine material particles are produced from thoughts (*Bhāva karma*) and from physical actions (*Dravya karmas*) and attach to the soul remains a mystery. According to some Jain *Āchāryas*, *karmāṇus* bind to the soul by *leshyās*, which are a kind of psychic coloration or glue. There are six types of *leshyās* (radiations), classified by their colours (wave lengths), namely black, blue, grey, fiery, yellow and white. These indicate progressively desirable *colours*, from bad (*pāp*) to good (*puṇya*) types of *karmas*; white representing the highest *puṇya karma*. We wonder if it is just a symbolic representation of a complicated process or there is really a physical or chemical process involved in attachment and detachment of *Karmāṇus*? These processes must be different for *ghāti* and *aghāti karmas*, the former affecting the soul and the latter affecting the genetic make up.

As we shall see in Chapter-7, all forces in nature, viz. electromagnetic, nuclear and gravitation act through their specific carrier particles. For example, photon is the carrier particle of the

electromagnetic force. We do not know, if likewise, *karma* is a kind of force and *karmāṇu* acts as its carrier particle. According to physics, a thought cannot produce a material particle because enormous energy is required for creating even the finest particle, as given by the Einstein's mass-energy relation. Therefore, *karmāṇus*, believed to be *pudgals*, have to be mass-less, extremely low energy particles or radiations. Furthermore, the soul is formless and how a *karmāṇu*, a material particle, gets 'attached' to it and remains with it, birth after birth, till it is shed when the *karma* is eradicated, is physically difficult to understand. One possibility is that the soul can go to different energy states and gets coloured by interaction of *karmāṇus* and gets decoloured when it returns to the ground state of purity. Alternatively, it is the mind, the repository of all thoughts, actions, experiences, and memories which constitutes the *karmāṇ sharīra*. We will discuss this aspect in Chapter-6.

Lot of research has been done in the past century on brain function. According to the medical science, every physical activity and thought activates, or excites, neurons in specific areas of the brain. The neurons may loose their excitation energy by emitting some radiation, when they return to their ground state (of no action or thought). The intensity and frequency of this radiation may be *karma* specific. Every frequency corresponds to a specific colour. This radiation may interact with the soul, be absorbed, and colour it accordingly. Thus the soul which in pure state has no colour may become coloured or impure. This mechanism may broadly provide a framework for understanding the complex process of what we colloquially call as attachment and detachment of *ghāti karmas* with the soul.

We may only speculate that the *aghāti karmas*, which determine the personality, health and age etc. of a person may act through molecular processes by which the person's DNA or genetic structure is modified, since physical aspects of a body are

known to be determined by genetic structure. Whether it is true and the way it actually works needs further investigation. With the recent developments in techniques of molecular biology, cloning and genetic modification some of these aspects can be scientifically studied.

Karma, jnāna and Guṇasthāns are intimately related. As bad *karmas* are shed, one moves to progressively higher spiritual stages, acquiring the corresponding level of *jnāna*. These aspects are discussed in the next Chapter.



CHAPTER-5

Fourteen steps to Enlightenment: Spiritual stages of Soul

(*Guṇasthān*)

See your Ātmā with your Ātmā- Bhagavan Mahavira

➤ *Spiritual stages of soul,*

➤ *Guṇasthān*

➤ *Relation between Guṇasthān, karma, and jñāna*

The journey to enlightenment begins from one's present state, the final destination being omniscience or *siddhahood*. This road is marked by 14 milestones, called *Guṇasthāns*. These 14 stages, representing increasing level or purity of consciousness, analogous to quantum states of elementary particles in physics, are like rungs of a ladder. Transitions from some of them to stages below or above are allowed whereas some transitions are forbidden. The ascendancy of the soul depends on the level of its purity achieved by following the processes outlined in Chapter-6. The final goal is to attain *Keval jñāna* (stage-13), after which one becomes a *siddha* (stage-14). Each stage bears a specific name signifying the extent of purity of the soul, as discussed in detail in various Jain scriptures (*Karma Granths*).

Before describing each of these milestones, it may be pertinent to describe some of the important landmarks on this path to enlightenment, viz. the stages- 2, 4, 7 and 14 (the final destination). Normally, one does not have the correct perception of life or knows its purpose and remains engrossed in the material world, one sees

around, knowing not that there is a spiritual existence beyond this world. A person who does not believe in the Cardinal Truths (existence of soul and procedures for its purification), outlined in Chapter-2, is living in a state of total delusion, i.e. falsehood (*mithyātva*). This is the lowest rung of the ladder, or the first stage. For such a person, there is no hope of liberation till he/she acquires firm faith in the Cardinal Truths and attains stage-2, where journey to higher stages can begin. At this stage the person becomes a genuine seeker.

Attaining higher states depends on getting rid of various delusions or *karmas*, as discussed in Chapter-4. As a seeker starts to practice compassion, forgiveness, renouncement and detachment from worldly possessions (*aparigraha*), and strives to lead a truthful life, he/she develops a state of equanimity and tranquility and progressively goes to higher stages. The perception related delusion dissolves in the fourth stage when a person gains the right perspective (*samyaktva*). As the aspirant gradually progresses in acquiring the qualities of compassion, truth and *aparigraha* in thought as well as in action (*jnāna* and *chāritra*), the perception gets clearer and the conduct (*chāritra*) related delusion gradually starts dissolving.

Eventually the aspirant attains the 8th stage. Thereafter the progress on this path is rapid since, after having practiced the right conduct in deeds, one has only to imbibe them in thought to get rid of various subtle passions. When both the conduct and thought related delusions have been totally overcome, one attains the 12th stage. At this stage, the defiling *karmas* are instantly destroyed and as one gets rid of all passions (including that for attaining *moksha*), the person attains enlightenment. This stage is designated as the 13th stage and is characterized by infinite knowledge, infinite energy, bliss etc. This does not mean the end of embodiment but in this stage, the person loses interest in the material world and attains a transcendental state of mind. The omniscient, after

completing the current life span, gives up the physical body and becomes a liberated soul, the *siddha*.

Within various stages (1 to 12), there can be limited upward or downward movements, as mentioned below. When the soul attains the highest and stable states of pure consciousness (stage-13 and 14), one does not descend to the lower states.

Now we discuss each of the fourteen *Guṇasthāns* in some detail. The journey begins with the realization of correct perspective (i.e. in accordance with the six cardinal truths, stage 2) and the aspirant gradually proceeds on this path through right conduct, purity of thought, destruction of all *karmas* and annihilation of the gross as well as subtle passions as mentioned below.

1. Falsehood (*Mithyātva*)

Living with false perception (*Mithyātva*) leads to a state of absolute delusion. In this frame of mind, the physical body and worldly possessions appear as the only real things and the person develops attachment to material objects, becomes possessive and remains engrossed in worldly pleasures. The person cannot think beyond the material world and does not believe in the existence of soul. Therefore, there is no scope for him/her to purify his soul and attain salvation.

2. Fleeting taste of right vision (*Sāsādan Samyaktva*)

When a person realises that the material world is not all that exists and starts wondering about consciousness, he/she occasionally gets a glimpse of the soul. As this faith strengthens, the person starts believing in the cardinal truths and acquires right vision (*samyak drishti*). From this stage, with even a fleeting taste of right vision, one can proceed on the journey to *moksha*. However even after attaining a higher state, for example the 4th stage, one can, howsoever briefly, develop a negative attitude and start doubting the cardinal truths, succumbing to the evil influence of passions. He/she is then afflicted with wrong faith, called

asādan. In such a situation, one falls back to the transitory stage-2 from where one may continue to slip down to stage-1 or regains his faith in the cardinal truths and rise to stage-3.

3. Confused state (*Mishra*)

This is a confused, unstable state in which some times a person believes in the existence of soul and sometimes he/she doubts it. Consequently, one's mind oscillates between the right and wrong perception. Although the person continues to perform right practices prescribed for seekers even during this state of confusion, occasional doubt in the veracity of the cardinal truths may stall further progress and the person may remain in this state for a long time.

4. Right faith, imperfect conduct (*Avirat Samyak drishti*)

Having unwavering faith in the six cardinal truths does not necessarily ensure that one is rigorously observing the right conduct (i.e. *aṇuvratas* and *mahāvratas* described in Chapter-6). One has to make a long and sustained effort to convert concepts into practice, that is to develop right conduct and control the mind under all circumstances. Such a state in which one has the right faith but lacks right conduct is the 4th stage, named *Avirat Samyaktva*.

During this stage, while one is going through the process of observing the right conduct, one realizes that the soul is the eternal, sentient Supreme Being and is the conscious 'knower'; the rest of the universe consists of impermanent, evanescent material objects, which have no relationship with the soul. The worldly manifestation of the soul is not its true nature and disappears when a person acquires the correct view of the self. This perception leads one to achieve a detached state of mind. Detachment from worldly phenomena and possessions reduces passions (*kashāya*) and results in further purification of the soul.

At this stage, due to the fructification of the past *karmas*, the soul may attain any of the following three stages, depending on

whether the passions i.e. anger, greed, pride (ego) and deceit are suppressed or eradicated altogether: (i) *Aupshamik*, where the passions continue to remain dormant, arising occasionally when they are again suppressed. This cycle continues still the person goes to a higher state; (ii) *Kshāyopshamik*, in which the passions are either suppressed or eliminated as and when they arise; and (iii) *Kshāyik*, when the passions are completely annihilated. In all these stages, the aspirant becomes detached from sensual pleasures, although he is neither able to observe total *ahimsā*, i.e. causing injury to mobile as well as immobile *jivas*, nor is he able to refrain from committing undesirable activities. As long as one can not control anger, pride, conceit, deceit or greed arising from passions due to past *karmas*, one continues to remain in the 4th stage.

5. Observing gross non-violence (*Desh-virat*)

When an aspirant in the fourth stage abstains from killing or causing hurt to mobile living creatures (with two or more sense organs) but finds it difficult to avoid killing or harming non-moving species (e.g. vegetables, algae, yeast), he/she attains the fifth stage. As the severely intense (*Apratyākhyānāvaraṇ*) passion is eradicated, the aspirant frequently experiences the true nature of the soul. The person develops a state of tranquility and peace and becomes totally detached from material entities. This stage is called *desh-virat* or *vrata-virat*. It is also considered as *sanyatāsanyat Guṇasthān*, as one is mentally practicing total abstinence from violence, falsehood, attachment, stealing and sensual pleasures and follows various *anuvratas* mentioned in Chapter-6.

6. Right conduct (*Pramatta Sanyat*)

In this stage, the aspirant is able to control his attachment to worldly pleasures and passions and attains *samyak chāritra*; i.e. conducts himself/herself thoughtfully and calmly with perfection. This is called the sixth stage of *Pramatta Sanyat Guṇasthān*.

However, in this stage *sanjwalan kashāya* (evanescent passion) still persists with mild intensity.

Usually a seeker behaves like a *sādhū* in this stage and follows the twenty eight primary rules and the associated sub-rules. These include: five *mahāvratas*, five *samitis*, six essentials, five sense controls and some penance and practices to minimise violence like manual uprooting of hair, non-bathing, sleeping on bare ground etc. Although the internal purity is achieved and maintained, mild feeling of attachment still persists at this stage.

A person can be involved in thoughtless behavior (conduct) in many ways; eighty of these are mentioned in the scriptures but fifteen important ones amongst them are: inappropriate narration about women or men, teacher (*guru*), food and nation; four passions of anger, pride, deceit and greed; behavior of five senses; sleep and love. Though such a behavior attracts some impurities, the seeker stops accruing any new *karmas* and the remanent passions are not strong enough to stop attainment of the sixth *Guṇasthān*.

Purity of thought is essential for attaining the sixth stage, after which the next (seventh) *Guṇasthān* is spontaneously attained. As such, the seeker may oscillate between the sixth and the seventh stages for a long time. One noteworthy point is that the seeker has to first experience the seventh *Guṇasthān*, even though he may later on slide back to the sixth stage.

7. Right conduct, subdued passions (*Apramatta Sanyat*)

A sincere seeker, having won over the various undesirable behaviours (conducts) mentioned above, attains the *Apramatta Guṇasthān* in which the passions are subdued i.e. in *sanjwalan* state. The only process consciously going on in the mind in this stage is meditation of the pure soul and one starts experiencing its beneficial results. This state persists in all the higher *Guṇasthāns*.

As mentioned above, the seeker keeps on oscillating between 6th and 7th stages, depending on the state of his/her mind and

conduct. Such a stage is called *swasthān apramatta sanyat*. On the other hand some seekers, after having developed unity with the soul, attain a higher degree of purity which is called *satishaya apramatta sanyat*. When a seeker employs all the mental and spiritual powers to detach from the material world and visualizes himself/ herself not merely as a physical body but as the soul, he/ she progresses further towards higher *Guṇasthāns*. As this effort in subduing the *prakritis* (the innate nature of *karma*) continues, though still inadequate to annihilate them completely, the ascent to eighth, ninth, tenth and the eleventh *Guṇasthāns* is gradual. When all the *chāritra mohanīya prakritis* (various types of attachments) are completely destroyed, one attains omniscience (thirteenth *Guṇasthān*).

8. Purity of thought (*Apūrvakaraṇ*)

By purifying thoughts, the souls go through an unprecedented (*apūrvā*) state of transformation (*karaṇ*) and attain exceptional purity in this *Guṇasthān*. Different souls undergo different degrees of transformations, which is somewhat subjective, depending on whether the passions are suppressed (*upsham shreṇī*) or eradicated (*kshapak shreṇī*).

9. Annihilation of gross passions (*Anivrittikaraṇ*)

For the soul in this *Guṇasthān*, the thirteen *prakritis* of the *nām karma* as well as the twenty *prakritis* of *mohanīya karma* are either subdued or completely destroyed by the strength of contemplation. *Anivritti* means ‘similar’ since all the souls attain the same degree of purity in this state although the level of modification required may be different for different souls, depending on their initial state. Souls having attained this *Guṇasthān* do not undergo any further *kārmic* retribution in subsequent births.

10. Subtle passions (*Sūkshma Samparāya*)

In this *Guṇasthān*, despite the purity of mind, some amount of greed still persists, intentionally or unintentionally. Of various

types of greed, the one for attaining *moksha* is the most difficult to overcome. Those who have their *sūkshma karma* either subdued or annihilated completely are said to be in the *Sūkshma Samparāya Guṇasthān*.

11. Mild passions (*Upshānt Kashāya*)

When various external and internal passions become subdued, a seeker attains this *Guṇasthān*. Out of the four destructive *karmas*, the *mohanīya karma* is in the *upasham* state while the other three are in the *kshayopasham* state. Since the soul is completely detached from passions, this stage is also called *Upshānt Kashāya Vitarāg Chhadmāwasthā Guṇasthān*.

12. Annihilation of all passions (*Kshīṇa Kashāya*)

A soul that has annihilated all passions and mastered perfect detachment, with complete elimination of all the *karmas*, attains this *Guṇasthān*. In spite of complete detachment, some minor (*kshīṇa*) imperfections (*kashāya*) persist; therefore this *Guṇasthān* is called *Kshīṇa Kashāya Vitarāg Chhadmāwasthā*. Those observing perfect conduct in this stage completely eradicate the *mohanīya karma* whereas the remaining three destructive *karmas* are in the *kshayopasham* stage. As soon as these three *karmas* are eradicated, one ascends to the thirteenth *Guṇasthān*.

13. Enlightened souls, Enlightened preachers (*Sayogī Kevalī Jina*)

Nine accomplishments (right faith, right conduct, infinite consciousness, right perception, charity, infinite *jnāna*, *bhog*, *upbhog*, and infinite vitality) are required for becoming a *kevalī* (omniscient). The souls who have achieved them by destroying all the *ghāti karmas*, become super-sensuous and are said to be in this *Guṇasthān*. Being in the sentient state, their sense organs are not required to perceive; for example eyes or light are not required for them to see things. Since their mind, speech and body functions are still operating, they are *sayog* and as they have overcome the

psychic as well as material *karmas* they are called *Jinas*. These *kevalīs* enlighten other aspirants by their divine words, motivating them on the path of liberation. Influx of *sātā vedanīya karma* arising from thought, body movements and speech do not lead to bondage of the soul because their passions are completely annihilated.

14. Liberated souls (Ayogī Kevalī Jina)

The *kevalīs* in this *Guṇasthān* have attained omniscience and are without any activities of mind, speech and body. Therefore, this *Guṇasthān* is called *Ayogī Kevalī Jina*. In this stage, the *kevalīs* also destroy all the *prakritis* (nature) of the *aghāti karmas* (non-destructive *karmas*) so that they are free from the cycles of birth and death and attain *siddhahood*.

Siddha Parameshthi:

Siddha Parameshthi are those who have traversed through the fourteen *Guṇasthāns* of the worldly existence, annihilated all the eight psychic (*bhāva*) and the material (*dravya*) *karmas* (Chapter-4) and achieved the state of eternal bliss. They attain eight great attributes (*samyaktva, anant jñāna, anant darshan, anant vīrya, sukshmatva, avagāhanatva, agurulaghutva, and avyavābādhatva*). In the absence of any psychic, conventional or matter *karmas*, they are liberated from the cycles of birth and death and will not be reborn. They become complete in themselves. In this stage, their souls ascend to the realm of purity, called *Siddha Shilā*, believed to be located at one edge (conventionally the uppermost part) of the universe. These blessed souls are called the *Siddhas*.

The purpose of describing these steps in detail is to emphasize that it is important to keep the goal in view and ascend the steps one by one. If one firmly believes in attaining enlightenment by following this path, one has already taken the first step and attained stage-2. Observing non-violence, quest for truth, giving up stealing and accumulation of material things, leads one to move to stage-4, acquiring several extra-ordinary powers (*siddhis*) corresponding

to this stage. Getting rid of anger, greed and attachment to worldly possessions leads one to reach stage-6 and giving them up in thought (*bhāva*) leads one to move one step further up the ladder. When all desires, including that of attaining enlightenment and *moksha* cease, all actions by deed, mind and thought are eliminated and right faith, right conduct, infinite consciousness and right perception are accomplished, one attains the highest state of liberation.

We have used several terms in Sanskrit in the above discussion without defining them. To explain them here would result in digressing from the main theme of the book. The reader is referred to various dictionaries¹ in which these terms are defined.

The elevation of the soul to progressively higher stages can be attained by correct perception together with certain practices which are described in the next chapter.



1. For example Jain Paribhashika Shabdakosh, Jain Vishwa Bharti Institute, Ladnun, 2009

CHAPTER-6

Purification of Mind, Body and Soul

Nānassasarmāyaro

Knowledge is meaningful only if it can be imbibed in conduct.

- *Behaviour of Mind, Body and chakras*
- *Mahāvratā, Essential practices, Prayers,*
 - *Yoga, Tapa, Dhyāna, Aṇuvratas,*
 - *Jnāna, Bhāvanā, Moksha,*
- *Physiological, psychological and spiritual effects*

We have so far discussed the theoretical foundations of Jainism, that is, the Cardinal Truths, the true nature of the universe (*Anekāntavād*), the laws governing interaction of soul and matter (*Karmavād*), and the various milestones on the path to enlightenment (*Guṇasthāns*). We now come to *kriyāvād*, the practical and experiential aspect of Jainism, which deals with the procedures (*kriyās*) for physical, psychical and spiritual improvement and for shedding of *karmas* that is the prerequisite for attaining enlightenment. For this purpose we have to intimately know the workings of our body, mind and soul. Although soul is essentially an entity which is indescribable, we have already discussed, to the extent possible, the soul and its inherent powers in Chapter- 2. What cannot be described about the soul is amenable to experience through some practices described in this chapter. We first discuss the attributes of mind which has to be controlled before we can experience the soul.

Mind:

Brain is a physical part of the body but its working is governed by mind. After the omnipotent soul, mind is the most powerful entity which encompasses the whole universe, both in space and time. It has a reach everywhere in the universe and beyond as well as in time— past, present and future and, therefore, its expanse is bigger than the universe and its reach is longer than eternity. It can perceive or project anything real or imaginary. Even the ‘God’ is a perception of mind. As a thought is the cause of all happenings, mind holds the key to man’s destiny. A thought does not, however, arise in isolation; usually a train of thoughts occurs in succession. Thoughts lead to emotions, which, in turn, determine the attitude of a person towards other persons, events or situations. Attitude controls a person’s behaviour that leads to action; how a person acts determines the habits of a person; habits constitute a man’s personality which ultimately shapes man’s destiny. For this reason it is said ‘a man is the master of his own destiny’; one essentially becomes what and how one thinks.

Human mind comprises three parts, the outer (conscious) mind, the inner (subconscious) mind and the super-conscious mind, which is the seat of the soul. The outer mind consists of two parts, the logical mind, located in the left hemisphere of the brain, and the intuitive and emotional mind which is located in the right hemisphere of the brain. Normally, the subconscious mind is not fully active. Both Jains and Buddhists have carried out a large number of studies to understand the functioning of mind, and developed techniques to activate the sub-conscious mind through meditation.

Mind is multidimensional and usually exists in an exalted state. It has unusual multi-tasking and parallel processing capabilities. It can instantly perceive, discriminate and form opinion on various persons, things or events. It thinks and functions in response to external stimuli. It is discursive and dualistic; It has

both positive as well as negative emotions – it desires, compares, plots, manipulates, indulges in anger, hate, love, jealousy, greed, pride etc. It is always engaged in asserting its supremacy by fragmenting, imagining, conceptualizing and accumulating experience. Thus an ordinary or outer mind is ceaselessly shifting in response to external influences, habitual tendencies, and environmental conditioning. Actually, it is constantly wavering, unstable, chaotic, confused, indisciplined, continuously changing, repetitive and meddling endlessly in others' affairs. It is rarely concerned with the self who is its real master and does not ponder over profound aspects of life, such as its impermanence, death, rebirth etc. Its energy is wastefully consumed by projecting outwards in the external world and it rarely looks inwards. No-mind is the ground state of mind when all its activities cease. The pristine nature of mind is defined by five qualities: It is vast and boundless like space; and possesses wisdom of everything. It is a perfect reflector, like a mirror, and faithfully reflects, in all its vivid details, whatever appears before it, without itself being affected in any way. It is for this reason called "mirror like wisdom of mind". It is discerning, i.e. it is impartial and has no bias in favor of or against any object. It is endowed with inherent wisdom by which it can distinguish between good and bad, virtue and evil and different phenomena without confusion. The mind is also endowed with analytical ability as a result of which it can visualize, judiciously analyze, and spontaneously and instantaneously comprehend various things and phenomena it encounters. It has the power of instant decision making.

In comparison, the inner mind, which is more powerful than the outer mind, is pure, pristine, endowed with awareness, cognizant, self illuminating, intuitive and always wakeful. However, it is engulfed in the outer mind, and obscured by mental scurry of our thoughts. The inner mind remains unaffected by any external change of environment, fear or excitement. It is said to be endowed with perfect knowledge (wisdom or *prajñā*). When the outer mind

attains the state of no-mind, then the infinite faculties of the inner mind manifest which can be experienced. However, the inner mind and its faculties are latent and have to be activated, to become fully functional. Mind is similar to a photographic film which has been exposed to everything it has come across; if one wants to project the self on it, the old exposures have to be erased otherwise the numerous superimposed images existing on it will make it fuzzy and indistinguishable. It is said that the mind is a bad master but a good slave and, therefore, it has to be kept under control. Upon death, the brain dies but the mind, which is also the repository of memory and experiences acquired during a person's life time, and is attached to the soul as *kārmaṇ sharīra*, is reborn according to one's *karma*.

With some idea of the inherent powers of soul (Chapter-2) and the functioning of mind as mentioned above, we now discuss some characteristics of the body. First of all, it must be realized that any living being is a miracle of nature. It cleverly defies several basic laws that govern the physical universe. Most importantly, it defies the law of entropy (a measure of disorderliness in a system), according to which all components of a system tend to move towards equilibrium state, i.e. the entropy of any physical system tends to increase with passage of time. In comparison, a biological system is the most orderly system in the universe and is capable of further increasing its orderliness through its own actions. Erwin Schrödinger in his 1944 book "What is Life?" explains that most physical phenomena on a large scale arise due to chaos prevailing on a small scale. He calls this principle "order from disorder". In reality there is no violation of any law of physics when the biological system and its physical environment are considered together and not separately. Whereas the entropy of a biological system decreases with time, that of its physical environment, with which it has close interaction, increases, effectively increasing the net entropy of both these systems taken as a whole. All it shows is that the biological system is capable of becoming more orderly at the expense of its physical environment.

There are billions of cells in the human body and, in a healthy body, each one of these cells functions in perfect order. When we consider functioning of brain, we find that along with its neural network system, brain behaves as the most orderly system in the body. As mentioned above, a biological system is capable of deriving energy from its environment. This energy is infinite and by following certain practices the physical sphere of influence of a body can be enlarged and enormous amount of energy can be derived by a living organism from the environment. This process is progressive and its scope is enormous. When we eat food, every cell in the body gets energy from it. When we breathe, all the cells including those in various *chakras* (Figure-6.1), get purified and energized, as discussed later in this chapter. This nourishes the

Major Endocrine Glands & Chakras

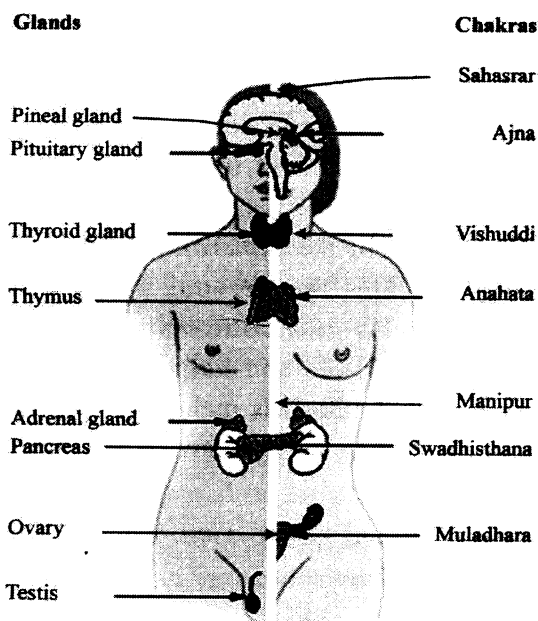


Figure - : 6. 1 : Seven main *chakras* in human body (right) corresponding to the various glands (left), which can be activated by practicing various *yogāsans*.

body and gives it energy and also makes brain more energetic and orderly, thereby reducing its entropy further. All Jain practices, in effect, are aimed at reducing the entropy, increasing the orderliness and rejuvenating the whole body metabolism, starting with the physical body, followed by the conscious mind and ultimately the sub-conscious and super-conscious minds. This also forms the basis of *Tantra* schools of Jainism and Buddhism. It may be noted that the body has inherent amplifying mechanism which is normally dormant but can be activated by conscious practices. Physics postulates an amplification effect, known as the “butterfly effect”. This effect envisages that if a butterfly flutters its wings, the atmosphere in the vicinity provides an enormous amplifying effect which can even turn it into a hurricane or a giant storm! The same is true of biological systems which are capable of amplifying the small amount of energy they derive from the environment into an enormous source of energy, by which the *kundalinī* located in the body can be activated.

The human body has several glands which control its various functions. The important body functions are associated with various *chakras*. Pineal gland, considered to be the master controller, is located in a small cavity on the back side of the pituitary gland in the middle of the brain, in the *Sahsrār chakra*. It controls body growth and also regulates the nervous system. In addition, it balances the brain cells and controls other glands such as hypothalamus and sex glands and helps to maintain the human reproductive system. It synthesizes melatonin for regulating sleep. Its proper functioning, however, requires adequate exposure of body to sunlight.

Hypothalamus, located in the *Ājnā chakra* (the so-called third eye) controls blood pressure, hunger, gastrointestinal functions, thirst, bladder contraction, heart rate, body temperature, sleep, wakefulness and general alertness. It also controls the anterior pituitary gland that secretes thyroid stimulating hormone (TSH),

which causes the thyroid gland to release T-4 and T-3 hormones that are essential for the general health of a person.

Thyroid gland, located at the upper end of the bronchial tube, in the *Vishuddhi chakra*, is responsible for maintaining youthfulness of a person. It utilizes the trace amount of iodine present in the body to secrete hormones which are essential in regulating the metabolism of fats, proteins and carbohydrates, thus aiding the process of digestion. It controls the metabolism of iron and phosphorus that are used in nerve and brain centers, and is especially helpful in the production and distribution of electric energy in the body. The two parathyroid glands are located above and below the thyroid gland near the vocal cord. These glands control the serum calcium concentration in the blood and thus help in activating our muscular and the nervous system.

The pituitary gland is located at the base of the brain inside the skull and is connected with the hypothalamus. It regulates secretion of hormones by other glands and is responsible for growth of our bones and muscles. It activates production of the seminal fluid in men and ovulation in women as also lactation in mothers just after childbirth. It also regulates kidney function and sleep.

The Thymus gland, consisting of two parts, is nested a little above the heart, in the *Anāhat chakra*. It is instrumental in development of the brain and formation of lymph cells. It is responsible for physical development of children till they attain the age of about 14 years.

Two triangular shaped glands located above the kidneys, in the *Manipur chakra*, attached to the diaphragm, are called adrenal glands. The secretion of these glands is essential for sustenance of our life. Their cortisone like hormones offer protection against several diseases, such as gout, defects in blood circulation, defects of colon, cancer, asthma etc. These glands stimulate liver and absorb glycogen. The adrenal glands help in contraction of different

kinds of arteries in skin and internal organs, and at the same time expand our muscles and the arteries of the heart. Besides, they control our emotional behavior and get activated whenever there is an imminent danger to our life, e.g. by bacterial or viral infection. These glands are important part of the immune system.

Pancreas, located in the stomach, near the kidneys, in the *swādhīsthān chakra*, produces insulin which controls the blood sugar. Gastrointestinal glands release a hormone (gastrin) that stimulates secretion of gastric acid, required for digestive functions.

Ovaries produce estrogen required for ovulation and menstrual cycle in women, whereas testes in men produce testosterone which stimulates the growth of male sex organs and creates masculine characteristics. *Chakras* (Fig. 6.1), as the hubs of nervous system, located at various points of the body, were known in Indian system several millennia before the glands were discovered by modern medical science.

With the understanding of some characteristics of the mind and the body functions that are controlled by various glands (*chakras*), we now discuss the procedures for enhancing their efficiency and the way in which they can reinforce each other. Merely understanding their working is, however, of no real consequence. Bhagavan Mahavira has said that unless the *jnāna* (knowledge) is translated into conduct (*chāritra*), it is of no use. Although knowledge is essential for leading a person on the right path, it is the practice which takes one forward to the goal. The basic requirement is that these practices must not be observed as mere rituals but with the aim of purifying the soul; rituals by themselves do not lead to any progress. When one practices with this aim, progress is quick. By some of the practices given below, it is said that one can acquire some supernatural powers (*siddhis*) but this should not be the aim. One should not use *siddhis* because it leads to bondage with *lobha karma* and hampers progress on the spiritual path of attaining *moksha* and should be ignored, rather

than be used for acquiring material benefits. Bearing this in mind and understanding various aspects of soul, mind and body, we now turn our attention to various Jain practices which are based on three aspects: *ahimsā* (non-violence), *sanyam* (restraint or self discipline) and *tapa* (penance). *Ahimsa* purifies the soul, *sanyam* purifies the mind and penances purify the body. These practices can improve one's conduct by destroying *karma*, and lead to attaining higher *Guṇasthāns*.

Mahāvratas (Ideal codes of conduct):

The primary practice comprises the five *mahāvratas*, which are essential for attaining enlightenment. These are: *ahimsā*, *satya*, *achorya*, *aparigraha* and *brahmacharya*, translated respectively as non-violence, truth, non-stealing, minimizing one's material requirements and ethical sexual conduct. We discuss them in detail below.

Ahimsā (non-violence):

Practicing non-violence is the primary requirement for attaining salvation. The physical basis of non-violence, based on the evolution of life on the earth, has been discussed in Chapter-1. Further, as mentioned in Chapter-3, all the *jīvas* (souls) in the universe are interlinked, interdependent and entangled with each other. Killing a *jīva* is essentially like killing a part of the self. *Acharāṅga Sūtra* asks, 'When you are cheating any one, whom are you actually cheating?' and replies, 'It is yourself.'; 'when you are harming someone, whom you are actually harming?' 'It is yourself.'; 'When you are destroying any one, whom are you actually destroying?' 'It is yourself'; 'When you are helping someone, whom are you actually helping?' 'It is yourself' and so on it goes. *Ahimsā* should not be regarded merely as non-killing of living species which is only the first step. Total non-violence is to be practiced at several levels, gross and subtle: refraining from killing any living being and stopping hurting them in thought, by speech or deeds. Feeling and experiencing the suffering of others by viewing oneself in the position of the sufferer is the next step.

True non-violence is accomplished when one's soul is in unison with others, experiencing their pain as well as pleasure. The highest form of non-violence involves unlimited compassion, when one attains the frame of mind in which one thinks in accordance with the saying of the Buddhist monk Nagarjuna as: "May everybody's ill deeds fructify for me, and all my virtues fructify for them".

It is said that practicing absolute and true non-violence instantly leads one to attain *Manahparyav jnāna*.

The first and foremost aspect of practicing non-violence is to embrace vegetarianism. It ordains that one must not kill any living being for food, which is neither necessary nor desirable. How would a human being feel if it were to be killed by someone for food? The same feeling, viz. the fear of death and pain, exists in the lower animals as well. It is a misconception that non-vegetarian food is essential for maintaining good health. On the contrary, the common experience is that refraining from non-vegetarian food is good for health. For one thing, diseases of the slaughtered animals are transferred to meat-eaters. Scientifically, it can be shown that the human anatomy has evolved to suit vegetarian diet. Embracing vegetarianism involves many aspects: refraining from killing higher animals and, avoiding to consume even lower animals/life forms (fungi and yeasts); refraining from consuming eggs which are meant to create new life rather than to be consumed by humans; and avoiding destruction of plants and trees to clear land for growing food grains and vegetables. The fact that plants have life was known to Jain scholars much before it was discovered by J.C. Bose in the last century and constitutes the foundation of Jainism. For this reason, Jainism advocates consuming only those fruits and vegetables which drop to the ground from trees and plants on their own, after ripening. It is also a myth that all bacteria are bad for our health. In fact, human body is a storehouse of all kinds of bacteria, good and bad (which cause various diseases), and we cannot survive without their beneficial effects. It is the

balance between the population of various types of bacteria which is important for maintaining good health, which can be achieved by observing cleanliness and not by killing them.

Practicing *ahimsā* in its real spirit involves a complete change in our life style and attitude, as discussed later. This includes avoiding trampling on insects and micro-organisms while walking on the ground, avoiding to kill water borne bacteria, and breathing slowly to avoid killing airborne *jīvas* etc. From killing of living beings, one has to transcend to the next higher level to avoid causing injury to them, feeling their pain as well as pleasure, and to the ultimate level where one realizes that there is no difference between the self (soul) and any other life form.

Violence in thought and/or action (*himsā*) results in severe undesirable *karmas*, particularly the *jnānāvaraṇīya* and *darshanāvarṇīya karmas*.

Satya (seeking Truth):

Truthfulness is the prime requirement for attaining salvation. It should not be interpreted as merely speaking the truth which, though essential, is only one aspect of truthful behavior. The real meaning of this vow is to constantly seek the truth by making earnest efforts. Some relevant questions that come to mind are: What is one's true identity? What is the ultimate truth (or cause) of the universe? What is the real purpose of life? What is the true path for attaining salvation? The search for truth is a continuing pursuit. Truth is actually interwoven with the universe and, therefore, one should critically examine everything around to search for it. Unlike Adi Shankaracharya's philosophy, Jainism does not believe the world to be an illusion; rather Jainism considers the world as a reality and exhorts one to study it to find out the laws that govern it. This concept provides a common ground between science and Jainism.

There are two ways of arriving at the truth. It can be done either by negation: truth is neither this, nor that, as has been

enunciated in the *Upanishads*, or by affirmation, i.e. it is this and also that. *Anekāntavād* propounds the second approach which is more positive. Everything in the universe is indeed a manifestation of the self. When one realizes this fact, one has understood the real meaning of existence. Various elements of truth (*tattvas*) are rather well established and are called the Cardinal Truths (Chapter-2). Their mere knowledge is, however, not enough; one has to realize and practice them in all the activities.

As far as their knowledge is concerned, everything in the universe, from the smallest atom to the largest structure, has two aspects: known and unknown. Something is known about everything but much more remains unknown about it. Knowledge is limited and ignorance is infinite. Science tries to increase the knowledge and reduce the ignorance. Jainism, on the other hand asserts that everything in the universe has two aspects: knowable and unknowable (by sensory organs). Science is concerned only with the first aspect, i.e. knowable. By purifying the soul, the unknowable can be experienced but one may not be able to express it through words. Thus knowledge, according to the Jain concept of seven modes of existence (*saptabhangī*), is divided into several categories—known, unknown and indescribable and combinations thereof. The indescribable can, nevertheless, be experienced by omniscients. To understand the knowable aspects of matter, Jainism proposes an approach based on standpoints (*nayas*), which could be many, such as practical approach (*vyavahār naya*) and definitive approach (*nishchaya naya*). Some of the allotropes or modes (*pariāyas*) may be different from a practical point of view but they are all ultimately manifestations of the same basic entity from the stand point of the definitive approach. In comparison, physics defines different forms of matter as having formed from their basic constituent particles viz. quarks, electrons, photons etc., which represent their true nature.

According to Jainism, *Anekāntavād* or multifacetedness and *Syādvād* (discussed in Chapter- 3) define the ultimate truth, that is, every attribute of matter is contextual and only partially true. According to these principles, the most definite statement, about nature of things, one can make is that no single attribute can describe the true nature of things unequivocally, completely or with absolute certainty. This concept can be applied to describe the constituents of the physical universe as well as the self (soul). Overlooking this basic fact amounts to falsehood, which results in creating bondage with several types of *karmas*, depending on one's motive, but certainly with *jnānāvaraṇīya karma* that obstructs one from acquiring true wisdom.

Brahmacharya (ethical sexual conduct):

Sexual energy is the main source of physical energy in the body. *Brahmacharya* implies that sexual energy be used for physical and mental wellbeing and not wasted by indulging in gratifying trivial sensual pleasures. In practice, *Brahmacharya* means judicious and ethical use of sexual energy and not indulging in inappropriate sexual behavior and lust. This, however, is just one aspect of good conduct. Actually one's behavior and the life style should aim to conserve and enhance the sexual energy as far as possible and convert it into higher forms (*Tej* and *Ojha*). In the extreme limit, *Brahmacharya* is equated to celibacy. Abstinence from sexual indulgence is merely the first step. The very desire of indulging in sexual activity, even its thought or speaking about it, depletes this energy and should be minimized or avoided completely.

Brahmacharya should thus be practiced at several levels. In a broad sense all activities of mind and body that result in depletion of energy should be avoided and activities that increase physical vitality and mental energy should be pursued. When *Brahmacharya* is practiced earnestly, the sexual energy gets transformed into conscious energy which elevates one's spiritual level.

Indulging in untoward sexual activities not only depletes one's physical but also the spiritual energy required for attaining *moksha*. It binds one to *mohanīya karma* which is very difficult to eradicate.

Aparigraha (non-possessiveness) and Achorya (non-stealing):

Parigraha (accumulation) has two aspects: acquiring material possessions and developing an attitude of possessiveness. *Aparigraha* is opposite of *parigraha*. On a physical level *aparigraha* means non-possession or hoarding of material things and on the mental level, which is more important, absence of the very desire of possession. Since it is impossible to live in this world without any material possessions - be it one's body or material things one needs to survive - in practice it amounts to minimizing one's needs. The true meaning of *aparigraha*, however, is to develop a sense of detachment with the material possessions, realizing that all possessions are transient in nature and we can not own anything for ever or nothing really belongs to us. Thus absence of the feeling of ownership or possessiveness of any thing or person, including one's own body, is the real *aparigraha* and it amounts to total non-possessiveness. With such a realisation of non-possessiveness, possessions automatically become meaningless. All violence in this world is rooted in developing the attitude of possessiveness or the belief that something belongs to us, is ours, or could be owned. Therefore, the concept of *aparigraha* is a logical corollary of non-violence.

Aparigraha (non-accumulation) should be practiced at various levels. One really does not need much to survive. Possessing only those things which are really needed and minimizing one's requirement of material things is only the first step. At a deeper level, when one realizes that all the souls are one, and the universe is manifestation of the self, the whole universe belongs to us. One, then, becomes the master of

everything and it becomes meaningless to establish ownership on anything, much less to steal it. The urge to possess arises from insecurity even though possessions are of no avail. For one who submits to the path of nature (Chapter-1), there is no reason to feel insecure and possessivity automatically vanishes. *Aparigraha* and *achorya* are thus two sides of the same coin. Possession, even in thought, creates bondage (*bandh*), a kind of hurdle in spiritual progress. The main reason to refrain from acquiring excessive possessions and stealing is that they bind us to various *karmas*. Even the thought of possessiveness or ownership is enough to bind us firmly to the *mohanīya karma*.

We have discussed above only the personal aspects of the five *mahāvratas*, related to the self, which can help one attain higher *Guṇasthāns* and lead one to enlightenment. Actually *mahāvratas* have more profound implications to society as well as to the world at large. Practicing them consciously can reduce conflicts, bring peace and harmony in the family and society at large. Non-violence can save many lives and lead to peaceful coexistence of various life forms on the earth. Observing non-violence, towards animals and humans alike, and non-possession automatically leads to the realization of the concept of 'one world'. Besides, *aparigraha* reduces consumption of material goods, thereby reducing the problem of pollution, global warming etc. and improving the environment of land, air and sea.

When a seeker decides to pursue the path of *moksha*, his/her attitude towards the self as well as others changes and the seeker starts following the five *mahāvratas* in all activities of life.

Aṇuvratas (minor codes of conduct):

Mahāvratas, the primary or ideal codes of conduct, are difficult to follow, particularly in the context of the present day lifestyle. However, we can still observe the basic principles in our conduct, without making any special effort to do so. We can attain purity of mind and soul by adhering to some basic norms, called

Aṇuvratas. These secondary codes of conduct, can be modified in the following manner to make them relevant to present day lifestyle:

1. Avoiding injury to mobile living beings, which have two or more sense organs, and desisting from deliberate acts of violence to all, even if we are not able to practice total non-violence.
2. Observing truthfulness in our behavior, and desisting from making false statements arising out of extreme affection or hatred for someone.
3. Observing ethical business practices, avoiding excessive profiteering, forgery, cheating, etc. and consciously minimizing the possession of all forms of material assets.
4. Refraining from owning anything that is not rightfully ours or acquired by unfair means.
5. Desisting from entering into sexual relationship with any person other than one's spouse.

The above five vows are easier to observe compared to the five *mahāvratas* discussed above. In practice, these can be further extended to include not getting involved in any destructive activities or supporting them in any manner; to endeavor to bring about peace and harmony in the world; saving the environment from wanton destruction; practicing religious tolerance; believing in human dignity and unity and not discriminating anyone on the basis of caste, color, creed etc.; not encouraging evil customs and rituals, and leading life free from addiction to intoxicants like alcohol, heroin, tobacco and unethical drugs merely for pleasure or sensual gratification.

Many of these codes of conduct can be easily followed at the personal level, some at social level and some at the national level. These can be supplemented by *Aṇuvratas* such as avoiding sinful acts (in accordance with the five *mahāvratas*) for predetermined short periods of time, observing fast, limiting the use of both

consumable and non-consumable goods as well as energy, and sharing food and things of basic needs equitably. These small steps go a long way and lead to the physical, mental as well as spiritual well being of the practitioner.

In a typical Jain home, it is not permitted to waste food, water and electricity (and other forms of energy). Jains earnestly strive to minimize hurting the feeling of others by deed, speech and thought. Every year a particular day is observed for seeking and granting forgiveness. During the period of *paryūshaṇ*, lasting 8 to 10 days, various Jain rituals such as fasting, observing complete vow of silence (*maun*), *sāmāyik*, *pratikramaṇ*, etc. are observed, with the aim to purify the body, mind and soul. On its completion, everyone seeks forgiveness, not only from those with whom they have interacted but from all the *jīvas* in the universe and, at the same time, unconditionally forgiving everyone, even those who have caused them hurt. This day is called the day of universal forgiveness when there is no enmity with any one and friendship with all. On this day of universal forgiveness, one also takes a vow not to be revengeful for acts of others towards them. Such acts of seeking and granting forgiveness eradicate several serious types of *karman*s besides ushering harmony and peace in the world. For Jains, forgiveness, even for wrong doing by others, is the greatest virtue one can have and is likened to fragrance of a flower even when it is being crushed.

The Essential Practices:

The benefits gained by practicing *mahāvratas* and *aṇuvratas* can be enhanced by some practices which are described as “essentials (*āvashyak*)”. It is difficult to observe the *mahāvratas* rigorously and, therefore, review of our activities on a daily basis is essential. Two practices, *sāmāyik* and *pratikramaṇ*, are prescribed for this purpose. *Sāmāyik* is a word derived from *sāmya* or *samata* or *amatva* (equanimity). *Sāmāyik* is essentially a process to be followed to attain a state of equanimity. For this, one must be seated

in a stable, motionless posture and meditate or devote oneself to *dharma-dhyāna*. It entails physical control of the body followed by control of the mind, seeking forgiveness for violating any of the five *vratas*, or for even a minor hurt caused to any living being, advertently or inadvertently. It has to be practiced daily for one *muhūrt* (48 minutes). This period has been determined by dividing 24 hours of the day in 30 parts, based on the period of human biorhythm cycle. However, one can mentally stay in that mode, as long as one desires, even while conducting other activities of daily life.

Pratikramaṇ (critical review of physical and mental activities) is usually carried out on a daily basis, either in the evening (or morning), peacefully seated in a stable position. It involves praying to all the *Tirthankars* for showing the correct path, withdrawing oneself from all undesirable activities, recounting all that happened during the specific period, and seeking forgiveness for any hurt caused by any acts of commission and omission towards all living beings.

In both these essential practices, wishing wellbeing (*mangal*) of every living being and seeking forgiveness from those who may have been harmed or suffered by our actions, advertently or inadvertently, with a resolve not to repeat to the best of one's ability, are the main objectives. This helps in dissolving *jnānāvarṇīya* and *darshanāvarṇīya karmas*.

Prayers:

Prayers are essentially means of surrendering oneself to the unknown forces that are beyond our control. Psychological effect of prayers is immense. It is the first step towards attaining peace of mind and equanimity. Prayer enables one to face the adverse situations in life with fortitude and optimism. Prayers should not be done merely as rituals and should be performed in the simplest possible way, bearing in mind that a sincere wish to pray is prayer itself. It should, however, be noted that prayers, no matter how

intense or earnest, cannot eradicate past *karmas*. Even *Arihants* have no power to absolve themselves or anybody else of their past *karmas*, good or bad. All they can do is to show us the right path and thus prevent us from acquiring fresh binding *karmas*. One should therefore pray only to get the right direction and for developing conviction for doing the right deeds and not for receiving any material benefits. Praying for achieving any material, or even spiritual benefits binds one to *mohaniya karma* and therefore one should pray only for purifying the self.

Yoga:

Yoga literally means union of two or more entities. Generally a system can be strengthened by integrating it with other systems. Presently we are concerned with our body, mind and soul. When all these three act in unison, it makes human beings as one of the most powerful entities in the universe. For example, if all the cells of the body work in tandem it becomes extremely powerful. Yoga or union of body cells can be achieved by practicing *tapa* or *bhakti*. If all the neurons in the brain work in unison, the mind becomes very powerful. This can be achieved by meditation. Likewise, when the conscious, sub-conscious and super-conscious minds are united by yoga and meditation, new faculties of mind get activated and one can know everything instinctively.

Patanjali's yoga consists of eight- fold practices (*yam, niyam, āsana, prāṇāyām, pratyāhār, dhāraṇā, dhyāna and samādhi*). The practice of *Yam* is designed for purification of mind and comprises *ahimsā, satya, asteya, aparigraha and brahmacharya*, the five *mahāvratas* discussed above. *Niyam* is designed for purification of the body, and includes *shauch* (cleanliness), *santosh* (satisfaction), *tapa, swādhyāya*, and *pranidhān* (total dedication to the cosmic power). After body and mind are purified, the third aspect of yoga, viz. *yogāsanas* can help connect body and mind through the nervous system. Some of the *āsanas* recommended for this purpose are *bhujangāsana, sarvangāsana, halāsana,*

shavāsana and *padmāsana*. *Goduhāsana* increases the potency (*vīrya*) and provides energy required for achieving difficult physical, mental and spiritual goals. The idea of various *yogāsanas* is to increase the flow of blood to their corresponding *chakras*. *Yogāsanas* must be accompanied by *prāṇāyām* (controlling the rate and intensity of breathing, i.e. *prāṇa shakti*). Other stages of *yoga* i.e. *pratyāhār*, *dhāraṇā*, *dhyāna* and *samādhi* will be discussed later. *Yoga* thus provides a path to achieve *samādhi* which is essentially a state of hibernation in which all the body functions become temporarily dormant. Cultivating spiritual consciousness requires activation of *kundalinī*, the serpent power. Physically *kundalinī* is the Vagus tenth cranial nerve, normally lying dormant in the Manipur *chakra*. By attaining the state of meditation in various postures, one can awaken and activate the *kundalinī* by flow of blood and energy and connect it to the *Sahasrār chakra* located in the crown of the head. For this purpose it is essential to meditate while sitting in *padmāsana*, *vajrāsana*, *sukhāsana* or standing in *kayotsarga* pose with erect spinal chord, as straight as an arrow.

Tapa (penance):

Tapa means practicing austerity or penance. The goal of practicing austerities is to cleanse the body of various toxins and improve the functioning of each organ. After the body gets purified and starts working efficiently, penances, *yogāsanas* and meditation can awaken the dormant powers of the body and break it free from various habits and addictions which arise because of the close bonds that exist between various sense organs (*indriyas*) and conscious (*mana*) and super-conscious (*chetan*) minds. When such a state has been achieved, practicing further penances can help dissolve the past *karmas*. Habits pose obstruction in keeping the mind in an alert state. Breaking free from habits is the first step to purify the body as well as the mind. Simply mortifying the body

may not be of much help and it is required that *tapas* are practiced with the purpose of meditating on the soul.

Tapas are of two types: external and internal. External *tapas* are classified into six types (*anshan*, *unodarī*, *vrittisankshep*, *rasaparityāg*, *sanyam* and *sanlīnatā*). These *tapas* are not related only to limited food intake but apply to all the sense organs. The requirement of each sense organ (*indriya*) is controlled by mind (*mana*) and not determined by their actual physical need. The requirements perceived by mind are usually unrealistically exaggerated. This is clear from the fact that sometimes we eat even when we are not hungry, sometimes we go by the clock to eat, rather than by the feeling of hunger, and sometimes we eat more than we should. It is therefore necessary to eliminate the mind's interference and determine the actual requirement of various *indriyas* directly. *Anshan*, which involves minimizing the intake of each sense organ or starving it altogether for some time, helps in realistic assessment of the actual physical need of each *indriya* namely hunger, sex, speech, vision, smell etc.

Jainism firmly believes that our state of mind depends on food intake, both in respect of its quality and quantity. Thus having no food can lead to the state of "no-mind". Therefore, fasting is the simplest way to attain the state of no-mind. *Unodarī tapa* is normally applied to food, in which one consumes slightly less amount of food than what one's body really requires. This can also be applied to other physical needs of the body, i.e. providing a little less than the physical requirement of each sense organ which in turn, rids them of the control of the mind. *Anshan* begins with eating *sātvik* food and fasting for different periods of time i.e. from eating only once a day to observing complete fast for one day or more (two, three, eight or ten days) and then for a month or more. Contrary to the common belief, it is not only possible but quite easy to fast continuously for several days. At the physical level, this

helps all the cells of the body to act in unison; hunger or lack of nourishment being the motivation to unite. On the mental level, fasting unites the brain with the body, whereas on the conscious level, it helps one to live free from worries and meditate, since food is essentially a distraction in the process of meditation. The other forms of *tapa* are: taking food without salt and oil for a day (*āyambīl*) or more (*Olī*) and there are many forms of *tapa* varying from a month to a year in which food of a particular type is taken, in accordance with a predetermined schedule (*varshītapa*, *vardhamān tapa* etc). Fasting unto death (*sanlekhanā* or *santhārā*) is the extreme form of *tapa* which completely rids one of the fear of death. Death has a special significance in Jainism because it is the gateway to the next life in the endless cycles of life and death. Death should not be treated merely as the end to one's life but as the beginning of the next life. One should meditate and watch oneself die rather than make efforts to continue living without being able to lead a purposeful life. *Sanlekhanā* is the surest way to witness one's own death. The last state of mind has much to do with the next birth (*yonī*). Fear of death and any form of grasping, yearning, longing and any trace of attachment to physical and emotional relationships (with one's own body, worldly possessions, and near and dear relatives) must be totally dissolved for salvation and *sanlekhanā* can help achieve this state.

For best results, fasting of various types must be accompanied by meditation. In absence of meditation or other spiritual practices, merely remaining without food, is not real *tapa*. In fact, when one is engrossed in deep meditation, it automatically leads to various types of *tapas*.

Vritisankshep focuses on each sense organ and reduces its requirements to the minimum, avoiding its interference with the normal functioning of other sense organs. *Rasa* or longing for pleasure is controlled by mind and is not a physical requirement

of sense organs. *Rasparityāg* is practiced to break the links between sense organs, mind and consciousness (*indriya*, *mana* and *chetanā*). Since *mana* controls the *indriyas* with the help of *chetanā*, breaking this link makes all of them to function independently. *Rasparityāg* has physiological effects on various body parameters as well as psychological effects. When one realizes that body (*kāyā*) is the source of all sufferings (*kleshas*), and the mind is not affected when the body is subjected to pain, one attains the state of *kāyaklesha*. Then mind does not worry about the body and can, therefore, be turned inwards, for meditation without any distraction. This is self discipline (*sanyam*). Channelising the energy inwards and concentrating on the chosen path leads one to a state when no *karmas*, good or bad, can perturb one's mind. In such a situation, one attains the state of *sthitiprajna*. The ultimate state attained by practicing all these *Bāhyantar tapas* is to achieve the state of *sanlīnatā* (total absorption in the self) in which all the three, body, mind and consciousness, act in unison and are continuously in the state of meditation. In this stage no part of the body or thought moves or acts without the consent or involvement of the consciousness. A person becomes totally independent of whatever happens outwardly around him/her and remains fully absorbed in the self.

Table 6.1: Various methods of meditation

| | |
|-----------------------------|------------------|
| 1 Prekshā Dhyāna | 7 Spand Dhyāna |
| 2 Patanjali Dhyāna | 8 Yoga Nidrā |
| 3 Vipassanā | 9 Mantra Dhyāna |
| 4 Transcendental Meditation | 10 Swapna Dhyāna |
| 5 Kāyotsarga | 11 Mrityu Dhyāna |
| 6 Nidrā Dhyāna | 12 Karma Dhyāna |

Internal *Tapas* (i.e. *abhayantar tapa*) involve *prāyaschit* (repentance or atonement for bad deeds), *vinay* (humility or politeness), *vaiyāvachcha* (service to others for dissolving the effects of the accumulated or *sanchit* bad karmas over the past), *Swādhyāya* (study of the self), *Dhyāna* (meditation) and *Kāyotsarga* (differentiation between the self and the body). *Dhyāna* results in realizing the true identity of the self (*smriti*), turning inward (*pratikramaṇ*) and recalling one's past lives (*jātismaraṇ*) etc. With the practice of various *tapas*, the physical bonds between the body and mind as well as the psychological bonds between body, mind and consciousness are broken and any further inflow of *karmas* is stopped.

Dhyāna (meditation):

Dhyāna is the prime requirement for uniting one's physical, mental and spiritual faculties. It is the least understood of all the practices mentioned above, and is considered difficult to attain whereas, in reality, practicing it is quite easy. In fact, one is essentially in the state of meditation all the time, because mind cannot remain unoccupied even for a moment. What is required is to direct the attention of mind from bad to good thoughts and eventually achieve the state of thoughtlessness. It is pertinent to ask what exactly *dhyāna* means and how it is attained. It begins with a kind of self-hypnosis to convince oneself of the power of the soul. After the mind is convinced, it gets obsessed about the soul and thinks of it all the time. Meditation certainly is neither thinking nor concentrating, but constant absorption of mind in soul. This takes one to the realm beyond mind into a state of thoughtlessness. At this stage one enters into meditation.

The conscious mind has multi-dimensional capability. It can simultaneously deliberate on a large number of topics at the same time. The mind is constantly changing and wandering, thinking of different objects, phenomena, events, expectations, apprehensions etc., in space (here and there) and time (past and future). To use

the entire capacity of mind to tackle a given problem involves concentration. Channelizing concentration on soul is *dhyāna*. Firstly, it is necessary for the ever changing, wandering, conscious mind to attain the state of ‘one mind’ by practicing meditation, after which the conscious and subconscious minds have to be integrated and thereafter one has to attain the state of no-mind. *Dhyāna* is to attain the innate pristine, uncorrupted state of mind. Since the subconscious mind mostly remains dormant, a bridge between the conscious and subconscious minds opens up immense possibilities. No-mind is the only permanent state of mind and with practice it can be attained at will at any time, which enables one to ‘see’ the soul as an observer. In a nutshell, ‘seeing the *Ātmā* (soul) with the *Ātmā*’ is *dhyāna*. Physically, *dhyāna* means activating the pineal gland, the so called third eye, which acts as an interface between one’s mind and the soul.

There are many types of *dhyānas* and innumerable ways of achieving them; some of them are listed in Table 6.1. We have added to this list *karma dhyāna* which can be practiced at any time. In this technique, one should concentrate on what one is doing (or thinking), good or bad, and be aware of its consequences, which will eventually manifest, sooner or later according to one’s own *karma*. This realization helps one to attain *dharma dhyāna* easily and quickly. The fact that *dhyāna* can be attained by several techniques implies that it is easy to accomplish. To start with, one has to choose a suitable method from those listed in the table and practice it regularly at a fixed time, at a fixed place and patiently. When properly cultivated, the mind can remain in the state of meditation all the time.

Basically *dhyāna* is of four types: *ārtta dhyāna*, *raudra dhyāna*, *dharma dhyāna* and *shukla dhyāna*. In *ārtta dhyāna* mind is all the time engaged in criticizing something or somebody and develops an attitude to grudge about everything. The mind gets so preoccupied with this activity that we forget everything else,

including our own existence. In *raudra dhyāna* one falsely accuses some event or a person for one's own misfortunes or miseries. Normally our tendency is that we do not consider ourselves responsible for an unpleasant situation and blame others for the same. In this blame game we get so preoccupied that we forget our real self as well as our goal in life. Thus no special effort is needed to get into *ārtta* or *raudra dhyāna*. In fact the mind is inadvertently engaged in them all the time. But both these *dhyānas* divert our attention from the cherished aim of attaining higher *Guṇasthāns*. Nothing worthwhile is achieved by practicing them, except more misery and these activities of mind deplete our positive energy. *Dharma dhyāna* focuses our attention and energy in a positive manner, leading us to conserve it. It is only a matter of diverting our ability of practicing *ārtta* and *raudra dhyāna* and channelizing it in a positive manner to enter into *dharma dhyāna*. The ultimate goal is to achieve the state of *shukla dhyāna*, a state of no-thought, in which one does not think of anything, ill or well, but remains absorbed in the self. When one achieves the state of no-mind (completely devoid of thoughts), the energy does not get dissipated.

Various methods of meditation are based on three basic techniques: concentration on one's breath (*prāna*), on an object, or on a *mantra*. Besides concentrating the mind on one's own breathing (inhalation and exhalation) or on a statue or image (*Tirthankar* or any *Ishta devta*, a symbol, a *chakra* in the body etc.), *dhyāna* can be attained by focusing the mind on a particular sound (*mantra*, *japa*), a thought or soul. An alternative approach is to let all thoughts, bad or good, pass till they are completely exhausted. The human mind constantly desires change. When all the ill feelings, leading to *ārtta* and *raudra dhyāna* are exhausted, the mind automatically turns to *dharma* or *shukla dhyāna*. But this process takes some time if our mind is preoccupied with ill feelings towards others and falsely accuses

them to be responsible for our ills. When this is eliminated, meditation automatically turns to *shukla dhyāna* which is a prerequisite for achieving *samādhi*.

Various procedures of meditation are not discussed here further except to mention that *dhyāna* needs to be cultivated by regular practice. Irrespective of the method adopted, initially the conscious mind has to be assigned two functions: one part which concentrates (on a Tirthankar or *Ishta devta* or on breathing, for example) and the other which monitors the meditating mind and brings it back to focus on the object of concentration, whenever it drifts away. The duration of the period of distraction gradually reduces as practice advances. When it becomes zero, that is one is able to have complete and continuous concentration for a long period (minutes to hours), both the parts, the concentrating mind and the monitoring mind, become one. In such a state of mind, one can concentrate on any object or thought at will.

After this comes the stage of no-mind or thought-free state. When this state is achieved, that is the thinking mind is bypassed, the analytical faculty is activated, enabling one to know everything about the object of thought. This leads to new insight into the true nature of the object. In the advanced stage of meditation, one need not make any conscious effort by the body; neither recite anything (state of *ajapā*), nor think about anything. Essentially one should become like a mountain standing firm, immovable, determined and unconcerned with others. In this way one stabilizes one's mind and the self remains immersed in the soul. This is the ultimate form of meditation. There are three prerequisites for attaining this state of meditation: devotion (complete faith in the method one is employing to attain *samādhi*), determination (conviction that I will certainly attain *samādhi* in this very session of meditation, no matter how much time and effort it requires) and dedication (putting everything, i.e. the whole world at stake till *samādhi* is attained).

The state of intense meditation can, however, be sustained only for short intervals of time but meditation must go on uninterrupted all through the day or night irrespective of other activities one is engaged in, to achieve the desired results. The first step is to observe the inherent nature of one's own mind, its behavior, its response (to anger, greed, attachment, pride, ego etc.) to various external situations and persons. After the inherent traits of one's mind, viz. its strengths and weaknesses, are realized, the next step is to channelize the thought process. The best course is to concentrate on one's '*Ishtadevta* i.e. *Tirthankar* or *Guru*', fully realizing that '*Ishtadevta*' is only a perception or projection of one's own mind and manifestation of one's own consciousness. The *Tantra* method of Jainism is powerful enough to animate the *Ishta devta* (*Gurudev* or *Tirthankar*), put life into it and feel it as real, bringing it out from the virtual realm to that of real existence. Intense contemplation on the image of *Tirthankar* formed in a mirror can animate the *Tirthankar*, real enough to touch, feel and converse with.

Several experiential milestones on the path to meditation have been mentioned in the Jain texts. After the state of sustained meditation on *Ishta devta* or *Tirthankar* is attained, the next stage is to unambiguously feel, oneness with 'Him', i.e. "I am the '*Tirthankar*' (cf. the concept of *So-ham* or *Aham Brahṁāsmi* in the Hindu philosophy). This leads to the attainment of non-duality (*advaita*) and thus the power of the deity is acquired by the self. As a result, psychic heat, i.e. a kind of inner fire, is generated, which is a type of psychic force. This is the real *tapa*. Controlled respiration and intense mental concentration produces a kind of 'light' (*jyoti*) that permeates the whole body, subsequently expanding outwards and eventually filling the whole universe. Contemplation on one's own image formed in a mirror enables one to realize the illusory nature of the body as well as of all other material objects in the universe. It leads to the realization that what is perceived by one's mind is not real and, therefore, cannot be trusted.

One can also meditate on dreams which enables one to enter the state of dreaming at will and returning to the state of wakefulness without any break, thus realizing illusory nature of wakefulness, sleep and dream. This is the 'fourth' state (*tūrya*) of mind which can observe the other three states. All these practices eventually lead to a pristine state of mind, state of formlessness and timelessness or *samādhi*, that transcends the domain of time-past, present as well as future.

Two points may be mentioned here to conclude the discussion on meditation. Firstly, it should be borne in mind that the process of meditation is not, by itself, meditation. Therefore some criteria must be applied to ascertain what constitutes the real meditation. Outwardly, change of attitude (becoming more compassionate to others, reduced intensity of anger, jealousy, desire, pride etc.) and change in behavior (tranquility, quality of dreams, reduced frequency of distractions etc.) can be some of the yardsticks to judge the progress in meditation. The real proof of meditation, however, is that even after a person stops meditating, the meditating state of mind continues involuntarily.

Jnāna:

Meditation cleanses one's mind of undesirable and irrelevant thoughts and when it is empty, true knowledge (wisdom or *jnāna*) spontaneously dawns upon the mind. *Jnāna* is pure knowledge, uninfluenced by the state of mind of the subject (self). It exists within the self, but is covered by *Jnānāvaraṇīya karma*. When this *karma* is eradicated by meditation and other penances, it spontaneously reveals itself.

As already mentioned, the universe consists of *jīva* and *ajīva*, the knower and the knowable. The knower (*jnātā*) knows the object to be known (*jneya*) through knowledge (*jnāna*). Thus there are only three entities, *jnātā*, *jneya*, and *jnāna*- in other words, the knower, the knowable (object) and the knowledge (Figure 6.2).

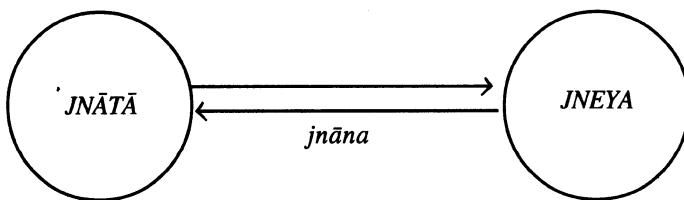


Figure-6.2: The interaction between the knower (jnātā) and the object (jneya) via knowledge (jnāna) indicating that the very process of observation modifies both the knower and the object, making it impossible to define their “states” at any instant precisely.

Both, the *jnātā* and *jneya* constantly modify each other through *jnāna* or by interaction and transfer of knowledge between them. Observations influence the state of an object, as has also been corroborated by the Heisenberg’s discovery of the Uncertainty Principle. It enunciates that all the attributes of an object in the micro-world (e.g. elementary particles) cannot be determined simultaneously. Evolution takes place in small steps (quantum jumps) when *jīva* interacts with the physical world and modifies itself. Every time a *jīva* observes a physical object or process, its state of mind changes. This also explains why worshipping an inanimate idol of the Enlightened beings brings about profound change in a person. This change may be to a higher or lower state of consciousness, depending on the type of interaction. This process takes place all the time, albeit in infinitesimal small steps, but its cumulative effect over a period of time is significant, as discussed in Chapter- 1.

When the distinction between the three of them, viz. *jnātā*, *jneya* and *jnāna* disappears, only *jnāna* remains and *jnātā* and *jneya* do not exist anymore. This is the state of pure knowledge. It is said that *jnāna* is the ‘body’ of *Siddhas*.

Jainism classifies *jnāna* into five types: *mati-jnāna*, *shrut-jnāna*, *avadhi-jnāna*, *manahparyav-jnāna* and *keval-jnāna*. *Mati*

and *shrut-jnāna* are sensory and *manahparyav* and *keval-jnāna* are extra-sensory. *Avadhi jnāna* can be partly sensory but is largely extra-sensory.

Mati jnāna (intuitive knowledge) is the primitive, inherent, innate type of *jnāna*, one is born with and is further developed subsequently by interaction with the environment around. Even primitive *jīvas*, including single-celled species possess it in some measure or form.

Shrut-jnāna is learning by interaction with other persons or from scriptures. This leads to one's mental evolution and then gradually transforms into *mati jnāna*. All *jīvas* acquire it by interaction with nature and some higher animals are capable of acquiring it through teachings by a *guru* or by self study of scriptures.

Avadhi jnāna (clairvoyance) is the knowledge that transcends both space and time. To a limited extent it can be sensory and can be acquired by training sensory organs and the mind. Scientists can predict the past and future of various objects, located near as well as far out in the universe, by using appropriate theories or by employing signal-enhancement techniques/instruments for seeing and listening, e.g. employing powerful telescopes, microscopes, antennas etc. However, to a large extent the *avadhi jnāna* depends on the activation of the unconscious mind.

Manahparyav-jnāna (telepathy) is entirely super-sensory. It develops only with the purity of the soul. When one practices total non-violence, one can enter into and unite with any other person's mind or know and influence others' thoughts. It requires existence of a consciousness field pervading all through the universe.

Keval jnāna (omniscience) implies that one loses identity of one's own body and mind completely and becomes one with the cosmic knowledge: a state of consciousness (*chetanā*). *Keval jnāna* is super-sensory. It can be acquired, not through sense organs but directly by the consciousness. It is a state in which one can see all

the *paryāyas* of various *dravyas* in space and time (past, present and future).

Attitude (*Bhāvanā*):

The attitude of a person practicing Jainism towards himself/herself, others and the universe undergoes a subtle change. He/she continuously ponders over the basic aspects of Jainism which is described by twelve attitudes, summarized as follows:

“Oh Soul, whatever you see around is perishable (*kshan bhangur*), exists by coincidental circumstances and is not everlasting (*anitya*). You are absolutely alone (*nitānt akelā*) and there is no one to protect you (*sharaṇāgat*). There is no real happiness (*ānanda*) in the world; everyone is indifferent (*parāya*). This body in which you reside is impure, abode of bones, flesh, blood and excreta. It looks alive and beautiful only because of your (*ātmā*’s) presence in it. In this world, everyone is trying to involve you in sensual pleasures, jealousy, attachment and anger (*rāga, dvesha, moha and krodha*). Take all this as unreal (*mithyā*) and get totally involved in your real self. Free yourself from worldly bondage by penance and various practices (*japa, tapa, shīl, sanyam and tyāga*), absorb yourself in your consciousness and attain the correct perception, true knowledge and perfect behavior (*samyak darshan, samyak jñāna, and samyak chāritra*). Equipped with *Anekānta*, walking on the path of *dharma*, following *Syādvād*, free yourself from all bondages and reside on the *Siddhashilā* (abode of the Siddhas).”

We are all aware of the impermanence of life and know that we are bound to die some day, but exactly when and how, is unpredictable. Whether tomorrow will come first or the next birth (i.e. death) we do not know. This should be borne in mind all the time (*mrityu dhyāna*) which would motivate us to pursue the path of enlightenment.

Moksha:

By practicing the Jain path described above (i.e. by practicing *ahimsā*, *tapa* and *sanyam*), the soul ultimately becomes free of all bondages, good and bad, and sheds all the material particles bound to the *ātmā*, even the minutest *karmāṇus*, which form the *kārman sharīra*. In this state, the soul attains a state of unprecedented purity and the highest level of consciousness. In such a state the self “perceives” everything past, present and future without the help of sense organs. The ecstasy experienced in this state can be verily compared to a blind man getting vision all of a sudden. The very realization, i.e. to know everything as it exists, is compelling enough for one to seek omniscience and follow the path of attaining *moksha*. In this state of omniscience, the soul acquires the correct perception and infinite power. The self experiences *jnāna*, *ānanda*, *chaitanya* and *vīrya* in infinite measure. Having achieved its goal, the soul thereafter does not go through the cycles of death and rebirth, but only exists in the exalted state of eternal bliss. The ultimate goal of the universe seems to be to separate *jīva* and *ajīva* in their pure states; the souls moving to the abode of *siddhas*, residing there eternally and the matter remaining behind in the *loka*.

Physiological, psychological and spiritual effects of Jain practices:

According to Jainism, the body is a multilayered entity. Various procedures described above, such as *tapa*, which mostly include dietary practices, meditation (*dhyāna*), verbal and mental silence (*mauna*), state of equanimity (*sāmāyik*) etc. are mainly directed towards shedding of *karmas* that affect the body, mind and soul at various levels. Some physiological effects due to *tapa* and *dhyāna* have been demonstrated but have not been systematically or quantitatively documented. The physiological effects enhance body metabolism by energizing various *chakras* (Figure- 6.1) and result in improvement of body functions as

reflected in various parameters, such as oxygen consumption, blood pressure, sugar level etc.; the psychological effects include changes in electroencephalogram (EEG), in which the alpha and theta waves of the brain stabilize, indicating improved mental concentration, and provide strength to face adverse situations in life with calm and tranquility. The brain waves have been grouped according to their approximate frequency range as: Beta (13 to 30 cycles per second, Hz), alpha (7-13 Hz), theta (3.5-7 Hz), delta (0.5-3.5 Hz) and gamma (80 to 120 Hz). No exhaustive study of effects of Jain meditation techniques (*Prekshā dhyāna* or *Kāyotsarga* etc.) have so far been documented but effects of Zen and Transcendental Meditation (TM) have been studied. We summarise below some results of these studies.

Study of the changes in wave intensity, bunching of waves and focal areas of brain from where they originate have been made for different stages of Zen and TM and have been compared with different states, e.g. wakefulness, sleep, dream etc., based on study of groups of practitioners, using EEG and spectral techniques. It was observed that alpha rhythm increased in amplitude, slowed down in frequency and extended to anterior regions at the beginning of meditation. In the next stage of meditation, theta frequencies, different from those of sleep, get diffused from frontal to posterior areas of the brain. They take the form of shorter theta periods or longer rhythmic theta trains. Rhythmic amplitude-modulated beta waves are present over the whole scalp in the third stage of deep meditation by advanced subjects. The most striking topographical alteration was the synchronization of anterior and posterior channels of the brain. For instance, a study showed that eight weeks of conscious meditation produced significant increase in left-sided anterior brain activity, which is associated with positive emotional states of the subject. Electroencephalograph recordings of skilled, expert meditators also showed a significant rise in gamma wave activity during the process of meditation. In one such study,

slow alpha waves appeared during meditation in the majority of subjects, regardless of their experience in Zen training, while theta waves appeared only in advanced groups, predominantly in the frontal region, with its frequency increasing in proportion to Zen experience. A study of monks with experience in Zen meditation showed that theta waves increased while the amplitude of alpha waves was attenuated during the period of meditation. The EEG changes during meditation may reflect intrinsic changes induced by zazen (meditation), in which, despite the attainment of relaxation, the quality of consciousness is heightened. Significant improvement in relaxation parameters has also been observed.

Although some changes in brain activity and the region of brain involved in this activity due to meditation have been established, the actual effect of meditation is highly subjective. The results are not universal or reproducible, and in a sense confusing, such that no general conclusions can be drawn. Clearly more and sustained study of a large number of expert meditators is required to get statistically significant results. According to Jainism, the spiritual effects include attainment of higher *Guṇasthāns* accompanied by several types of supernatural powers (*siddhis*), but this is only experienced by the individual and is difficult to prove scientifically. Obviously, there is considerable scope for further study in this area and new analytical criteria and statistical techniques need to be developed to quantify the results.



CHAPTER-7

Jainism and Modern Science

Before the universe was created, there was Dharma (laws).

There is nothing universal except the laws of physics.

Nothing is absolute, neither time, nor space, nor properties of matter.

Everything depends on the frame of reference used.

- *Scientific basis of Jainism*
- *Nature of matter,*
- *Science Sūtras,*
- *Jainism and modern physics*

Science is truly universal, because it is based on certain laws which are eternal, objective, applicable everywhere, at all times and govern all the processes involving matter. It is independent of the observer and the results are verifiable and therefore acceptable to everyone. In this sense it is not subjective. As already discussed in Chapter-1, Jainism is also universal because it is based on some laws which govern both, the living (*jīva*) and non-living (*ajīva*). These laws are eternal, universal, inviolable and are non-subjective. The ‘apparent’ subjectivity in the domain of living beings arises due to the laws of *karma* which, depending on the individual’s *karmas*, deludes his/her perception, knowledge and response. When one has eradicated all *karmas* and attains omniscience, the subjectivity vanishes. Both Jainism and science do not subscribe to miracles. Thus Jainism is quite scientific in its approach. It may, therefore, be appropriate to look for similarities between science and Jainism. The purpose of this chapter is to critically examine if any common ground exists between them.

Jainism divides the universe into two independent entities, *jīva* and *ajīva*, the latter falls in the domain of physical sciences. The true nature of both *jīva* and *ajīva* is multifacetedness, with infinite attributes correctly described by *Anekāntavād*, in contextual relationship (*Syādvād*), and can be expressed by seven-folded modes of *Saptabhangī* (Chapter-3). These laws are mentioned in various Jain scriptures (e.g. *Bhagavati Sūtra*) but the physical concepts are best summarized in *Tattvartha Sūtra* of Umaswati, written some 1800 years ago. In particular, Chapter- 5 of *Tattvartha Sūtra* is devoted to physics. We refer to this chapter for a comparison between science and Jainism.

Observations of the universe and scientific studies, both theoretical and experimental, conducted in the laboratory, have resulted in formulation of certain general laws which govern various phenomena occurring in the universe. Cosmology recognizes matter (energy and matter being inter-convertible) and space-time as the elements constituting the physical universe and three types of forces, viz. gravitation, electroweak (which includes electricity, magnetism and weak nuclear forces), and strong nuclear forces together with their associated fields, which operate everywhere. Electricity, magnetism and weak nuclear forces, which were earlier considered to be independent, were subsequently integrated into a single electroweak force. Similarly it is possible that electroweak, gravity and strong nuclear forces may be manifestation of a single force, but it has so far not been possible to unite them in a single theory. Thus the physical universe, as we understand now, is made of six components: space, time, matter (and energy), and three forces (and their associated fields). In comparison, Jainism states that the material universe is composed of five components: space, time, matter, *dharmāstikāya*, and *adharmāstikāya*. Thus there is agreement between cosmology and Jainism on the three constituents of the universe, i.e. matter, space and time. According to the experiments conducted by Michelson and Morley, in late 19th century, the concept of medium of motion (postulated as the

all pervading, stationary, luminiferous ether, traditionally considered to be equivalent to *dharmāstikāya*) has been disproved. We do not have much idea of what *adharmāstikāya* (interpreted as the medium of rest) is in terms of modern physics or cosmology, although some candidates have been debated, as will be discussed in Chapter-8. The two constituents of the universe, *dharmāstikāya* and *adharmāstikāya*, remain a subject of further investigation.

There has been tremendous scientific progress in the last four hundred years, especially since the time of Galileo, and the behavior of matter under different conditions is rather well understood. Physically, the matter is divided in two parts, the macro (gross) and the micro (subtle), for which the laws of classical physics and quantum physics respectively are applicable. To appreciate this division into macro and micro, it may be appropriate to briefly recapitulate the historical background which led to the development of quantum physics and some of the basic principles of physics.

Scientific view of macro- and the micro- matter:

The universe is made up of matter which ranges in size from the smallest invisible particles to the infinitely large structures like galaxies. The smallest entity known at present is quark although search for even smaller entities is continuing. The biggest is, of course, the universe, by definition, but presently scientists are talking of multi-verses, or a group of universes. Astronomical observations suggest that our universe was formed some 14 billion years ago in the aftermath of the Big Bang episode. It consists of about 200 billion or more galaxies, each of which comprises over 100 billion stars and even more planetary (rocky or gaseous) objects (Figure- 7.1).

This vast zoo, we call our universe, with its innumerable variety of objects, representing the large diversity of matter and life, is made up of just 118 elements. These elements combine, in multitude of ways, to form several thousand chemical compounds and several hundred rocky minerals which form the building blocks of various living species as well as the material structures. Among

these elements, 92 elements (and their isotopes) are either stable or are radioactive, with life times long enough to have survived for billions of years since they were formed in the cosmos, i.e. in stars, galaxies and in space, by nuclear reactions. These elements constitute the Earth. About 26 elements (and their isotopes) with short life time, not found on Earth now, are being synthesized in the interiors of various stars. This observation of only a few elements giving rise to a large variety of things in the universe led philosophers to speculate that there may be just one basic particle, from which all the elements are formed. This principle was at the heart of Dalton's atomic theory and the basis of *Ekāntavād*, according to which 'one' can give rise to 'all'.

As the search for the ultimate constituent of matter continued, three particles, viz. proton, electron and neutron, were discovered from which all the 118 elements and more than 2000 isotopes of these elements could be formed. For a while scientists thought that this 'trinity' could be used in different proportions to build the whole physical universe. As further research continued, some serious problems arose. By the nineteen sixties, using high energy accelerators and cosmic rays coming to Earth from various stars, scientists were able to discover hundreds of elementary particles. It appeared unlikely that such a large number of elementary particles would combine in a variety of ways and result in the formation of fewer, just 118 elements. Therefore it was postulated that the so called elementary particles should themselves be made up of a small number of fundamental entities. The search for smaller and more fundamental constituents is an ever continuing quest. Study of these elementary particles, which form the gross universe, showed that the rules that govern the gross matter (mentioned here as macro-world) and those governing the elementary particles (identified as belonging to the micro-world) are significantly different. The gross or visible matter follows the rules of classical mechanics whereas sub-atomic particles follow quantum mechanics.

The visible universe (minerals, rocks, planets, stars, galaxies etc. or the gross matter) follows the laws of classical physics. Basically, the state of the gross structures in the universe can be determined by summing up the state of all its components. If mass (m), velocity (v) and position (x) of its various components are known, the state of the system can be determined by the proposition that the whole is the sum of parts.

$$\text{Whole} = \text{Sum (m, v, x)}_{\text{parts}}$$

The physical objects have only a few physical attributes, like mass, shape and motion. The origin of mass is still not properly understood. The problem with mass of particles is that when the elementary particles were initially formed in the universe, just after the Big Bang, they had no mass. How did they acquire mass? Ernst Mach made an attempt to explain it by what is known after him as Mach's principle. Broadly speaking, it states that the inertial mass of a body is solely due to interaction of other bodies in the universe with it. Extending this idea further, Einstein stated that "the entire inertia of a point mass is the effect of the presence of all other masses, deriving from a kind of interaction from the latter". Heller (1975) put it in the following way "The local inertial frames are entirely determined by the distribution and motion of all matter present in the universe". There is yet no 'proof' of this principle but Einstein is said to have derived much inspiration from the Mach's principle in development of his Theory of Relativity. It highlights one important aspect of matter that everything in the universe is interactive and influences each other. Recently several new ideas for origin of mass have been proposed. The discovery of Higgs Boson (popularly but wrongly called "God" particle) at CERN indicates the presence of Higgs field throughout the universe. Various particles acquired their mass by their interaction with the Higgs field.

As we go down to the level of molecules and elementary particles, the classical physics fails and some new principles of quantum physics come into play. Thus there is a distinction between

laws of classical physics, that are applicable to the gross universe, and the laws of quantum physics applicable to the subtle world, consisting of subatomic elementary particles. In classical physics, the statement that 'a particle is at position x' is either true or false. In contrast, in quantum physics, the best statement that can be made is probabilistic, i.e. if a measurement is made at a particular position x, the probability that the particle will be found there would lie between 0 to 1. It means that particle may not be there (probability=0), or may be there (probability=1), and its presence at that point may have all the probabilities in between. This concept has some similarity to the principle of *Syādvād*, discussed in Chapter-3. Most concepts arising from common sense, based on observation of gross matter, are not valid in the quantum world. More importantly, quantum domain is not just an objective, classical, mechanical, Newtonian world where the various processes follow the laws of mechanics but there are some phenomena which are influenced by the very act of observation. Thus, one comes to the conclusion that the behavior of particles changes when they are observed and also the way they are observed, i.e. the technique used for their observation. This is the first step towards understanding the interaction between *jīva* and *ajīva* entities as explained below.

Quantum Mechanics:

Quantum mechanics puts stringent constraints on the level of certainty of our knowledge. Two tenets of quantum mechanics that are relevant to this discussion may be mentioned here. One of the propositions is that the universe does not exist if you do not observe it, equivalent to the paradox of the Schrödinger's cat (for popular exposition see e.g. Gribbin, 1993). This implies that the universe and the observer exist together as a pair and neither can exist without the other. The other concept is that a particle behaves differently at different times. This is clear from the famous double-slit experiment (Figure- 7. 2) which is the backbone of quantum mechanics and the origin of the concept of particle-wave duality.

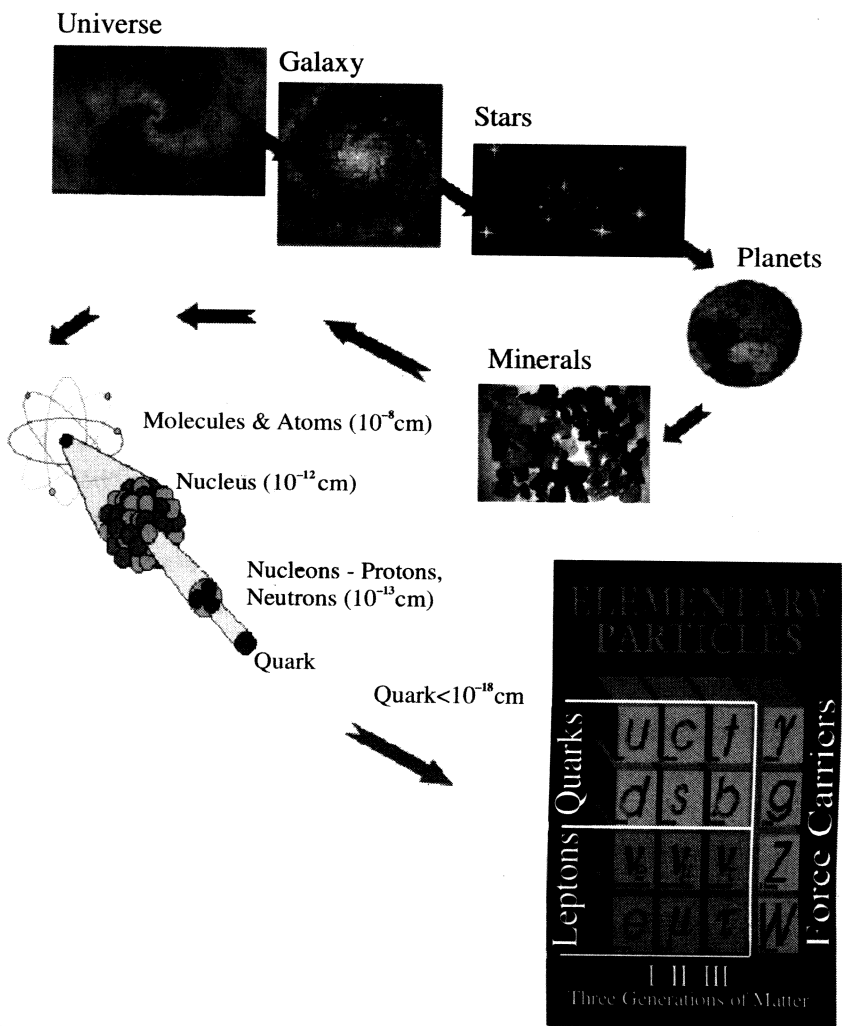


Figure - 7. 1: The gross to subtle components of the universe. Gross structures starting with galaxies, stars, planets, rocks to minerals going to the minutest atomic and sub-atomic, elementary particles. Sixty elementary particles (quarks, leptons and force carriers, together with their antiparticles), known to be the building blocks of matter are arranged in the box on lower right according to their attributes (quarks, leptons and force carriers). Higgs boson, a carrier particle for mass, discovered recently may be added to this list, but it is better to wait till other variants of Higgs boson, if they exist, are discovered. Graviton (g) has not yet been discovered.

Quantum numbers:

Besides the properties like mass, electrical charge, motion etc., the elementary particles have several other attributes which are

denoted by quantum numbers that do not change continuously (like slope of a ramp) but in steps (like rungs of a ladder), conventionally in multiples of 1 or 1/2. There are quantum numbers¹ like positional (e.g. orbital) quantum numbers, isospin, strangeness, colour etc.

Quarks, leptons and force carrier particles are currently regarded as the basic building blocks from which the entire material universe is made. Based on these particles, a model has been developed which is called the “Standard Model”, according to which the protons and neutrons are made of quarks. There are six quarks and six leptons, in all. According to Murray Gell-Mann, a Nobel laureate in physics, three generations of quarks and leptons exist. Leptons include particles called mesons and their associated massless or low mass neutrinos. In addition there are six carrier particles corresponding to various fields. Photon, for example, is the carrier particle for the electromagnetic field. These 18 elementary particles, together with their anti-particles, constitute the building blocks of the material universe. To these we may add the recently discovered Higgs Boson and graviton; the latter has not yet been discovered.

According to the Standard Model in particle physics, currently accepted as the best model concerning the electromagnetic, weak, and strong nuclear interactions (but excluding gravitation), there are three generations of particles as follows.

First generation

Quarks: down¹ and up¹ quarks

Leptons: electron (e) and its neutrino (ν_e)

Second generation

Quarks: strange and charm quarks

Leptons: mu meson (μ) and its neutrino (ν_μ)

Third generation

Quarks: bottom and top quarks

Leptons: Tau (τ) and its associated neutrino (ν_τ).

-
1. In the unknown territory of quantum physics, names have been given at the fancy of the discoverer and should not be interpreted in terms of their literal meaning.

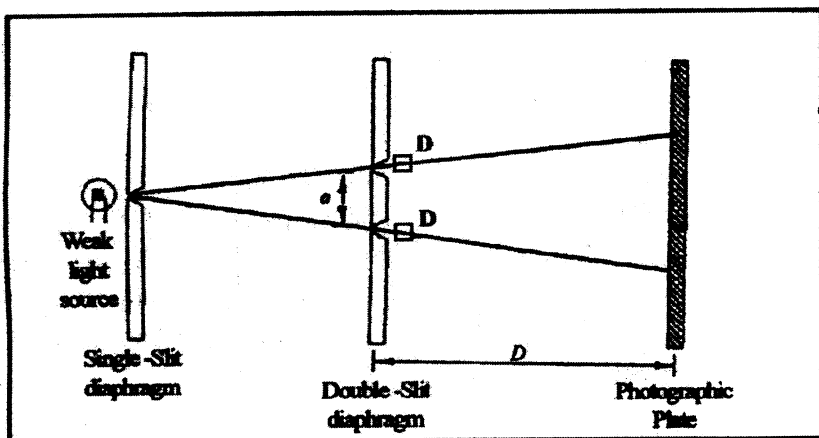
These six quarks come in three colors (red, blue and yellow) making them 18 in all. The 18 quarks and the 6 leptons (together with their anti- particles) sum up to 48. Gluons act as their carriers and there are eight of them. Adding to these, the carriers of electromagnetic force, i.e. photons, W^\pm bosons and Z^0 , the total number becomes 60. These sixty particles make up the whole universe. To this may be added Higgs Boson, responsible for giving rise to mass of various particles and graviton, the postulated carrier of gravitational field.

The six types of quarks are named as up, down, top, bottom, strange and charm. However, 'up' does not really mean up in the literal sense, nor 'bottom' means bottom but these are just names to distinguish them from each other. Likewise, the quantum numbers called color and flavor have nothing to do with their literal meaning. 'Color' actually indicates a type of force. So when a quark is assigned a color (usually red, yellow or blue for the simple purpose of distinguishing between them), it simply means they experience a kind of force, called the 'strong' nuclear force, which is different for each of them. Similarly gluons have flavor representing different attributes. What these attributes physically mean is inexpressible. The main point here is that as we progressively go to the finer (more subtle) and finer constituents of matter, new attributes come into play and the number of attributes increases. This seemingly agrees with the principle of *Anekāntavād*, discussed in Chapter-3.

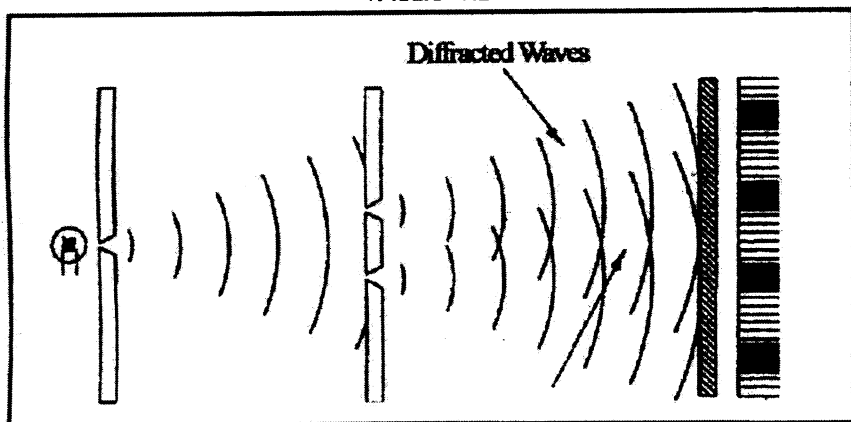
Some of the quantum phenomena cannot be comprehended by common logic, nor can be described in words in any language. They appear 'weird and illogical'. Generally, all one can say is that perhaps it is like that, a concept similar to *Syādvād*. Some of these states cannot be described and thus apparently agree with the concept of indescribability, as in the seven modes of existence (*saptabhaṅgī*).

Some new concepts were developed to understand the quantum mechanical behavior of elementary particles. The principle of symmetry and complementarity seem to play a role in the macro

world too. In addition, in the micro world, we have the Heisenberg's Uncertainty principle, Pauli's Exclusion principle, Entanglement etc. Before we discuss the quantum behavior, we briefly introduce some of these principles, which have helped us in understanding the nature of the universe:



(Figure- 7.2-a)



(Figure- 7.2-b)

Figure- 7.2 : (a) The double slit experiment showing that photons (or electrons) act as particles when observed by particle detectors (D), giving characteristic spots on the photographic plate, and (b) manifesting as waves when they go unobserved, giving rise to the well known interference pattern that is characteristic of waves, proving the dual behavior of elementary particles.

1. Principle of complementarity
2. Principle of symmetry
3. Uncertainty principle
4. Exclusion principle
5. Entanglement

Principle of Complementarity:

The principle of complementarity implies that opposite characteristics of an entity are actually part of its nature and both together describe it more completely. Neils Bohr who propounded the basic principles of quantum physics explained it through the principle of complementarity, considered to be one of the most revolutionary concepts of modern physics. For example, some experiments showed light photon (or electron) sometimes behaves like a compact solid object, i.e. a particle, like a grain of sand, and sometimes like a wave, similar to a ripples seen in a pond. These contradictory results - whether it is a particle or a wave- made it difficult to understand the real nature of photon. The western philosophers and scientists could not reconcile this dual behavior for a long time which was ultimately understood on the basis of complementarity (Figure- 3.1), that both taken together explain the real nature of a photon which is wave as well as particle.

In the famous double-slit experiment (Figure- 7. 2), a beam of photons incident on two slits, after passing through them, hits a photographic plate. The experiment can be conducted in two ways: one with photon detectors placed right beside each slit so that the photons can be observed as they pass through the slits, and without the detectors so that the photons can travel undetected. When the detectors are used, every photon is observed to pass through one or the other slit and they essentially behave like particles (Figure- 7. 2a). However, when the photon detectors are removed, a pattern of alternating light and dark spots, produced by interference of light, is observed indicating that the photons behave like waves,

with an individual photon spreading out and passing through both the slits at the same instant of time (Figure- 7. 2b). The outcome of the experiment then depends on whether one wants to measure the particle nature of photons or their wave nature. This experiment is taken as an evidence of the hypothesis that behavior of an inanimate particle, like a photon, changes when it is being observed. But, the questions that arise are “How do photons ‘know’ that they are being observed?”. In the real world, change of behavior of a person, when being watched, is a well known psychic phenomena but such a change of behavior in the material world is quite puzzling. Does it mean that even inanimate particles possess a psyche? Scientists do not agree with this interpretation but have explained it on the basis of plurality of attributes.

In Jainism, this phenomena is easily understood in the framework of *Anekāntavād* (Chapter- 3) which propounds that reality manifests through different attributes at different times and opposites and extremes allow us to learn the true nature of reality. It may be noted that, in contrast, Buddhism avoided extremes and Gautam Buddha advocated the path of the “Golden Mean” to reconcile mutually contradictory views. This is the basic difference between Jainism, which advocates the extremes, and Buddhism, which lays emphasis on the middle path.

Principle of Symmetry:

Nature loves symmetry and, therefore, symmetry has played a key role in understanding nature. All the living species, galaxies, planets, trees, minerals, molecules, atoms etc. are symmetrical in some respect or the other. There are many forms of symmetry, such as left-right symmetry, mirror symmetry, time symmetry and so on. The conservation laws, on which both classical and quantum physics are based, are an outcome of the symmetry principle. In the Mendeleev’s Periodic Table, elements are arranged in eight-fold symmetry. The 118 elements in it can be arranged in the form of octets, and their properties repeat after every eighth member.

The elementary particles also behave in a similar manner. In fact, symmetry principle has been used as a powerful tool to predict the existence of many unknown particles by Gell-Mann and other scientists. He arranged the elementary particles in the “eightfold way” and was eventually able to predict and discover quark, the smallest constituent of protons and neutrons. It is now known that elementary particles, called hadrons, can be organized in octets (8) and decuplets (10) whereas leptons are organized in nonets (9).

Sometimes symmetry is also violated. Parity, an attribute of the nucleus of an atom, for example, is a mirror symmetry which is found to be violated in certain nuclear reactions. Thus existence of symmetry as well as its violation are of fundamental importance in understanding the true nature of the basic processes governing the behavior of fundamental particles. This is consistent with *syādvād* which denies any absolutely true, perfect, universal law.

Uncertainty principle:

Measurements made to quantify the state of a particle shows that, at any given instant of time, all the parameters cannot be measured simultaneously with perfection (without errors). If measurement of some physical quantity is made, then according to quantum physics, the state of the particle changes instantaneously into a different state. It is not because one cannot measure the parameters accurately due to limited precision of the instruments or the technique employed but that the measurement cannot be made without changing the state of the particle. This principle, discovered by Heisenberg, is known as the Uncertainty principle. For example, both the parameters in the coupled pairs (known as conjugate variables) of energy (E) and time (t), or position (x) and momentum (p) can only be known within some minimum uncertainty, defined by the Planck constant which is the quantum of action. Planck’s constant is very small (6.625×10^{-34} joule. sec) and therefore the magnitude of uncertainty is also quite small, but none the less, has a finite value.

When an observer consciously observes a particle, it is equivalent to making a measurement and, according to the Uncertainty principle, the state of the object changes. The Uncertainty principle, however, does not say anything about the observer. According to Jainism, in any interaction the transfer of knowledge from the object to the observer changes the states of both, the object as well as the observer (Figure- 6. 2). Jainism propounds that any observation of an object invariably brings about a change in the level of consciousness of the observer. Therefore, the Uncertainty principle can be extended to the realm of consciousness (*jīva*) because its level of consciousness also changes by interaction with matter. Thus, with every measurement, not only the state of the object changes, but the state of the observer (*jīva*) too changes. It is possible that the uncertainty in the parameters of the object is converted into information and is transferred to the observer, which in turn changes state of his consciousness. Specifically, the Uncertainty principle offers a choice, though limited, of variation in the resultant states of any reaction. In the domain of biology, such a choice can bring about diversity, and hence evolution of species. As an example, the uncertainty in energy levels of the reactants offers a scope for variation in biochemical reactions, leading to products which are slightly different and, in the long run, can bring about evolutionary changes in different species.

Exclusion Principle:

The Exclusion Principle, first enunciated by Wolfgang Pauli states that two elementary particles cannot exist in the same “state” at the same place, and at the same instant of time. This was aptly and elegantly described by the poet-saint Kabir (1398-1518 CE) who said in one of his couplets “When I am there, God is not there and when God is there I do not exist, because the space (of love) is too narrow to accommodate two of us (being in the same state)”.

Individually, various quantum numbers may describe the state of a particle only partly, but taken together they describe the whole. In the world of elementary particles, we encounter two other phenomena, viz. confinement and entanglement which have some relevance to the present discussion. The property of “confinement” of quarks in the quark-gluon plasma has been observed. Simply stated, quarks cannot be isolated and cannot exist in a free state. They remain confined in the gluon plasma like the soul remains confined in the body and cannot be isolated from it.

Entanglement:

Entanglement implies that behavior of particles, produced in the same process, is inter-related. Briefly stated, when two independent systems of particles undergo temporary physical interaction due to known forces between them and then separate again, their quantum states become entangled and they can no longer be described independent of each other, as they were before the interaction. Since all the particles in the universe were produced simultaneously at the time of Big Bang episode, it is conceivable that they are all entangled in one way or the other.

Greenstein and Zanjoc in their article “On quantum challenge” exemplify another aspect of quantum mechanics. In the macro world, if we throw a ball to strike a wall within a room with two windows, the ball can go out of the room only through one of the two windows. In the quantum world, when a particle (e.g. electron or photon) hits a barrier which has two or more holes, they can go out through all the holes simultaneously. Notions of causality and separation in space i.e. impossibility of being at multiple locations simultaneously have been demolished by the quantum theory. It invalidates our perception of spatial separation and is called the phenomenon of superposition, of being at two places simultaneously at the same instant of time. Quantum mechanics also enables us to create the whole universe out of nothing because virtual particle pairs can be created out of nothing, by fluctuations in the vacuum

energy. The whole universe is virtual, an illusion created out of nothing, as the eminent seer Shankaracharya (788-820 CE) said, and the modern science agrees with this view, at least conceptually. Yet there are laws that govern the quantum processes which cannot be violated.

Science in a nutshell:

With the realization that the nature follows some definite laws and the laws which govern the gross universe and those that govern the micro-universe are different, we briefly summarize the underlying physics through the following short *Sūtras*:

1. The processes occurring in the physical universe are deterministic in the sense that they follow certain laws.
2. These laws are universal, applicable at all places, at all times and govern the various processes taking place in the universe.
3. The material universe can be divided into two parts, the gross (macro) and the subtle (*sūkshma* or micro). The laws governing these two regimes are different. The processes involving gross matter are deterministic and those involving subtle matter are probabilistic.
4. Both the macro as well as micro worlds are symmetric in respect of most of their attributes.
5. The macro world (visible to the unaided eye as well as seen through telescopes) follows the laws of classical mechanics. The governing law is that the properties of the whole system are the sum of the properties of its constituent parts. This is the law of addition of various properties of the gross world, like mass, volume, and parameters of motion etc.
6. In both the regimes, mass (M) and energy (E) are inter convertible, in accordance with the Einstein's relation $E = Mc^2$ where c is the velocity of light. Mass can take many forms and so can energy but the sum total of mass and energy of a system is always constant.

7. In any transformation, laws of conservation are strictly followed as mass/energy can neither be destroyed nor created.
8. Conservation laws are applicable to energy, momentum, charge, symmetry and all the other attributes.
9. Time always moves in the forward direction. This arrow of time is determined by increase in entropy, a measure of disorder, by which energy tends to get uniformly distributed in all the components of the system.
10. The micro-world (molecules and smaller entities, i.e. atoms, elementary particles, as small as they can get) is governed by quantum mechanics. Some of the deterministic laws of classical physics are not valid in the quantum domain.
11. In the micro-world, new properties (attributes) emerge. One such attribute is duality, i.e. the same particle, such as a photon, can behave either as a solid particle of matter or as a wave under different conditions. As one goes to finer and finer particles, newer attributes (called quantum states) arise.
12. In the micro-world, particles exist in certain discrete states. There is no continuous transition from one state to another but any change takes place by a quantum jump.
13. Every thing in nature has a large number of coexisting attributes and some of them manifest at different times under different conditions. Even though some of these attributes may be mutually contradictory, all of them together represent the true nature of the whole.
14. Processes in the micro-world follow certain principles, viz. Uncertainty principle, Exclusion principle, Entanglement etc.
15. The Uncertainty Principle requires that any two conjugate attributes of a particle (like position and momentum or energy and time) cannot be simultaneously measured with exactness and will have some errors. This is not due to limitation of the measurement technique but is due to a fundamental law which

prohibits precise measurement of both the parameters simultaneously.

16. Exclusion principle implies that two particles identical in all their attributes cannot coexist at the same time, at the same place.
17. Entanglement implies that all the properties of particles produced by the same process are mutually interdependent, no matter where they are located. If the state of one of the particles is known, the state of the other can be predicted.
18. According to the Standard Model of particle physics, the whole universe can be built from 18 elementary particles and their variants including antiparticles (totaling 61) which are the basic building blocks of matter. These include 6 quarks, 6 leptons, and 6 carrier particles (photon, gluon, W^\pm bosons, Z^0 and Higgs boson). The postulated graviton, carrier particle of gravitation, may be added to this list.
19. Certain forces and their fields operate on every material particle in the universe. There are seven forces in all, of which electricity, magnetism and gravitation follow the inverse square law. Nuclear forces are of two types, weak and strong. Electricity, magnetism and weak nuclear forces are manifestation of the same basic interaction, called electro-weak interaction. Thus we are left with three basic forces: Electro-weak, strong and gravitation. Efforts are underway to see if they could possibly be manifestation of a single force and could be united in a "Grand Unification" theory which will account for all the forces existing in nature.
20. Under the influence of the strong nuclear force, quarks combine to form protons and neutrons, which, in turn, combine with electrons under the influence of electromagnetic forces to form atoms. Atoms combine together to form molecules and different molecules combine

to form compounds. Compounds form minerals; minerals form rocks which, under the influence of gravitational force, form large structures like planets, stars and galaxies (see Chapter-10 for the theory of association and dissociation).

21. Presently it is believed that the universe is made up of 4% strongly interacting visible matter, 21% dark (invisible) weakly interacting matter and 75 % dark energy.
22. Three-dimensional space and time form the four dimensional universe but it has been postulated that the universe may have as many as 11 dimensions.
23. Velocity of photons is the highest that any material particle can achieve. This is the basic premise of the Special Theory of Relativity. Information cannot be transmitted at a speed higher than the velocity of light, although some particles (Tachyons), have been postulated to travel faster than light.
24. The universe may be in a steady state or was created in the Big Bang episode or may be cyclic or oscillating between expansion and contraction. Currently, the universe is in an expanding phase.

In summary, according to our present understanding, the basic constituents of the physical universe are Mass (and Energy), Space and time and the three forces (Electro-weak, Gravitation and Strong) together with their associated fields. Further work may result in their unification or addition of some more constituents, e.g. Higgs field permeating the whole universe responsible for the mass of particles.

We have summarized above some relevant concepts of science in the same form as the Jain *Sūtras* are compiled in scriptures so that they can be directly compared. We now turn to *Tattvartha Sūtra* which devotes its Chapter-5 to physical aspects. Jainism recognizes that the universe (material world) is real but it is not what is perceived by the human mind. The reason is that the mind

perceives the universe through various sense organs, which are imperfect and have severe limitations (Chapter-1). When mind perceives an object or a process, the question to be asked is “What is real?” Is it the object, the mind which perceives (like a mirror perceiving an object placed in front of it), or is it the very act of perception? According to *Anekāntavād*, matter has many attributes, all of which cannot be perceived at the same time. Furthermore, the mind perceives an object or a phenomenon based on its past experiences so that it is conditioned by its past perceptions, i.e. it is constantly learning and updating itself. It can therefore never be perfect. The perception depends on the observer and as the consciousness evolves, the perception comes closer to truth (say from the perception of an ant, to that of an elephant, to that of a human). Only the perception of a *kevalī* (omniscient), being supersensory, not depending on the imperfect sensory organs, is perfect. The Jain scriptures are believed to be compilations of the concepts enunciated by the omniscient *kevalīs*.

Jain concept of the universe involves a finite *Loka* (visible universe) immersed in an invisible and infinite *Aloka*. The universe consists of two groups of entities — *jīva* (living) and *ajīva* (non-living). *Ajīva* consists of five “substances”: *ākāśh* (space), *dharmāstikāya*, *adharmāstikāya*, matter, and time. The existence of these six basic substances, which are eternal and inexhaustible, defines the physical extent of the universe. *Jīva* (psychical or sentient beings), and matter (*pudgalāstikāya*) are active, i.e. capable of interacting and corporeal, whereas others (*ākāśh*, *dharmāstikāya*, *adharmāstikāya* and *kāl* (time) are non-corporeal, passive, inert, coexisting everywhere in the universe, non-interacting with each other, and non-interfering in each other’s functions. “Substance” here does not mean “matter or thing” but denotes basic constituents referred to as *dravyas*, *tattvas*, reals or “varities”. *Ākāśh*, unlike space of modern cosmology which gets distorted by the presence of matter, is something which merely provides abode (place) to

other “substances” and does not partake in any process or get modified in any manner. Matter or *pudgala* is subject to modification and can exist in many modes (forms or *paryāyas*). *Ākāśh*, *dharmāstikāya* and *adharmāstikāya* by themselves are stationary (motionless), continuous, homogeneous, uniform and isotropic in all directions. *Dharmāstikāya* and *adharmāstikāya* are single, indivisible entities. Matter is made up of infinitesimally small, indivisible particles, called *paramāṇus*, which are dimensionless. *Paramāṇus* or their clusters constituting matter have corporeal properties termed as sense of ‘touch’, ‘smell’, ‘taste’ and ‘colour’. *Paramāṇus* combine together to make ‘*vargaṇās*’ and give rise to various types of clusters of matter and acquire new properties, as discussed in Chapter-10. Similarly, *Ākāśh* and time are sometimes treated as made up of infinitesimally small, indivisible units called *pradesha* and *kalāṇu* respectively.

Science accepts the existence of space, time and matter being the constituents of the universe. If the universe is going to expand for ever, the space around it must be infinite. This may be similar to Jain concept of *alok*, but ‘space’ of cosmology and Jain *ākāśh* are not identical in every respect. It may be noted that the space gets distorted by gravitational field and can itself expand or contract, according to the General Theory of Relativity, whereas Jain *ākāśh* is passive and cannot expand or contract and cannot get distorted by gravitation or in any manner. This is a significant difference in properties of space and *ākāśh*. The other two constituents are *dharmāstikāya* and *adharmāstikāya*. In Jainism, they are traditionally considered to be media of motion and rest respectively. Their scientific equivalents have not been determined so far. Their existence can possibly explain the origin of the property of “inertia”. Alternatively, since *dharmāstikāya* facilitates motion and *adharmāstikāya* ensures that a body stays in the state of rest, they can lead to the first law of motion, according to which a body continues to be in the state of uniform motion or condition of rest (unless acted upon by an external force).

The ‘matter’ is similar to *pudgalāstikāya* in the sense that many of their properties are the same, except that the matter is convertible into formless energy, whereas *pudgal* is said to have a definite form. This apparent contradiction can be resolved, by slight reinterpretation of the relevant *shlokas* in *Tattvartha Sūtra* so that *pudgal* can have form and also be formless.

It may be noted that there is no mention of various forces and their associated fields in Jain cosmology, although in connection with consciousness, the scriptures do mention a conscious or Buddha field (*chaitanya kshetra*) pervading throughout the universe. In our attempt to find further similarities between modern cosmology and Jainism, we may ask if it is possible that *dharmāstikāya* and *adharmāstikāya* are the two entities from which various forces can arise. We may speculate that the three known forces (gravitation, electroweak and strong nuclear) can possibly originate from these two entities, one being a cause of motion and the other resisting motion. Some of the properties of *dharmāstikāya* are in agreement with those of dark energy, responsible for early accelerated inflationary phase of the universe. These are frontier areas of research and could be potential areas for further investigation.

Conservation laws were well known to Jains for thousands of years and were widely used for estimating several parameters of the universe. For example, Jainism asserts that quantity of the six eternal constituents (*reals*) of the universe, mentioned above, is constant and cannot be changed in any way, whereas science considers that matter (energy), momentum and many other attributes of matter are conserved in all physical and chemical processes.

Modern science divides matter into two types, macro and micro, as discussed above. In comparison, Jainism divides *pudgal* into six categories that are progressively finer - from gross to subtle. The examples given are — earth, water, light and shadow, smell and taste, *karmāṇu*, and *paramāṇu* respectively. There is some

conflict in the order of subtleness in this sequence in view of our scientific understanding of these objects but we may agree with the end members of this sequence from the grossest Earth to the subtlest *paramāṇu*.

In the fields of astronomy (Sun, Moon, universe etc. as mentioned in *Surya Prajnapti*, *Chandra Prajnapti*, and Chapter-3 of *Tattvartha Sūtra*), and geography (Jambu dvīpa etc., see e.g. Chapter-2 of *Tattvartha Sūtra*), there remain serious conflicts with the modern observations. These will be discussed in the next chapter.

Having considered the physical universe from the viewpoint of modern physics as well as Jainism, we now turn to *jīva*. It is not clear whether the laws that are applicable to subatomic particles are also applicable to soul, which is infinitely small and subtle. In this context, we consider three principles here: *Anekāntavād*, Mach's principle, and entanglement.

Anekāntavād is applicable equally to the material world as to the sentient universe. We have already discussed above (and also in Chapter-3), some similarities of *Syādvād* and *Anekāntavād* with quantum mechanical concepts that operate in the realm of the micro world. The fact that these Jain concepts were known for several millennia, at least since the time of Mahavira (about 2600 years ago), much before the advent of quantum mechanics, gives much credence to the scientific basis of Jainism (see e.g. Bhandari and Pokharna, 2015).

Mach's Principle and Ahimsā:

Although Newton's laws of gravitation are well formulated, in spite of the discovery of Higgs boson and Higgs field, we do not yet fully understand how the inertial mass of a body arises. Ernst Mach gave some idea on this vital question by proposing that the inertial mass of a body arises due to its interaction with other bodies in the universe. The implication of Mach's principle is that inertial mass cannot exist in isolation. One may ask if this principle can be extended to *jīva*. We live in a totally interactive world and, according to Jainism, everything here is interdependent. This is

true for *ajīva* as well as for *jīva* or soul (consciousness). Life certainly cannot exist in isolation. If all living beings, except one, in the universe (or even on Earth) become extinct, the last one remaining will, also not be able to survive. Therefore life is mutually inclusive, supportive and exists as a result of interdependence (or interaction) with other living species. This is enunciated in the famous Jain concept of *Parasparopagraho jīvānām*.

The principle of non-violence immediately follows from this paradigm since the “whole” becomes a cause for the existence of the “part” and vice versa. In this sense both are indistinguishable from each other. In effect, when, one kills somebody, or inflicts harm on any living species, howsoever primitive, one is actually killing or harming a part of the self. It is like committing suicide to some extent. In fact one’s very existence is due to the others.

The inertial mass, which is a physical entity and the consciousness, which is a spiritual attribute, are both interactive in nature and their origin is a consequence of interaction with other entities in the rest of the universe.

‘Parasparopagraho jīvānām’ and the entangled souls:

Entanglement essentially involves superposition of states of two or more particles, taken together as one system. Two particles, which are located miles apart or even in opposite parts of the universe, behave in a synergetic way; if the properties of one of the particles are determined, the properties of the other can be predicted. Thus the behavior of one depends on the other, regardless of the separation between them. Thus entanglement can transcend the limits of space. The same principle is valid for sentient beings and, therefore, all *jīvas* are entangled. In practice it is in accordance with the dictum that the best way to help oneself is to help others. As already quoted, one Jain Sutra asks “when you are cheating any one, whom you are actually cheating? and replies “It is yourself”; when you are destroying any one whom are you actually

destroying? ” It is yourself”; and when you are helping some one, whom are you actually helping? “It is your self” and so on it goes.

We have discussed above some aspects of Jainism and modern physics and find that there are some principles common between them. We thus see that by properly blending Jain concepts and amalgamating them with those of modern physics, it should be possible to understand the true nature of material as well as the living universe and make some predictions. *Anekāntavād* can be applied to test many of the predictions of modern science and may also have some role to play in making the correct choice between various possibilities. We conclude this chapter by summarizing the areas of agreement and disagreement between Jain philosophy and science.

Jainism treats the universe as interplay between *jīva* and *ajīva*. Everything in the universe, howsoever trivial, exists for creating conditions that are conducive for sustenance of *jīva*. Nothing, even the minutest, farthest, or apparently unrelated, is useless as far as *jīva* is concerned. Jainism emphasizes that both *jīva* and *ajīva* are governed by certain laws which are eternal, universal and cannot be violated under any condition. Science deals only with matter which is governed by the laws of physics that are universal and inviolable. Thus the scope of Jainism is much wider compared to that of science, although their approach is similar.

We now discuss a few points which have relevance to both.

1. *Anekāntavād*, applicable to both *jīva* and *ajīva*, can be compared with the principle of complementarity, an important concept in quantum mechanics. *Anekāntavād*, however, goes much beyond complementarity, i.e. instead of just two opposite aspects it considers infinite modes in between the two extreme opposite attributes.

2. Jainism considers *jīva* and *ajīva* as the knower and the knowable. They interact through knowledge which affects both of them. Physics deals with the knowable objects through observation

(knowledge) and emphasizes that the very process of observation modifies, in some way, the object that is observed. This has led to the Heisenberg's Principle of Uncertainty. In comparison, Jainism propounds that the process of acquiring knowledge modifies both the observer and the object. The change in the knower is experiential which, based on everyday experience, appears to be real.

3. One of the fundamental tenets of Jainism is *Karmavād*, which is equivalent to principle of causality in physics, with the difference that it is applicable to both, sentient as well as non-sentient.

4. Causality has led to the principle of determinism in physics, which implies that given well defined initial conditions, every state that follows is predetermined because all processes and modifications are governed by certain laws. This is equivalent to *kramabaddha paryāya*, a kind of determinism in the sentient world, which is a consequence of *Karmavād*.

5. The question of origin of inertial mass in physics led Ernst Mach to postulate that the mass in a body arises because of the mass present in the rest of the universe. This is equivalent to the one of the basic principles of Jainism, called *Parasparopagraho jivānām*, which has been reinterpreted here to mean that life at any place exists because of the presence of life in the rest of the universe. This is also similar to the concept of *Sūnyavād* in Buddhism. *Sūnyavād* is a very profound philosophy having multiple implications. According to the Buddhist scholar Nagarjuna (ca. 150-250 CE), one interpretation of *Sūnyavād* is that one exists because of the others, otherwise one, by oneself, is cipher or nothing (*sūnya*). Thus the self, like cipher, has only a contextual value.

6. The concept of '*Parasparopagraho jivānām*' can also be considered as equivalent to the principle of entanglement, i.e. every *jīva* is entangled with all other *jīvas* present in the universe, no matter who and where they are located. This principle immediately

leads to the concept of non-violence, because if all the *jivas* are interdependent and our life depends on the life of others, every life is sacred and, therefore, every lifeform should be protected and respected, for the sake of our own survival.

7. Although the universe involves a constant interplay between *jīva* and *ajīva*, it is the *jīva* (self) which controls and directs the behavior of *ajīva*. The presence of *jīva* (*ātmā*) in the material (inanimate) body controls the body functions and creates the right conditions for its sustenance. It has been proposed that the same is true of the whole Earth, which is broadly made up of two components, i.e. biosphere (*jīva*) and geosphere (*ajīva*). Thus, with the coexistence of living species and non-living matter, the whole world acts as a single large organism and the biosphere modifies the geosphere, according to its requirements. There are ample evidences of such changes in the geologic history of the earth. To quote an example, the change from reducing environment, containing ammonia, methane, carbon dioxide etc. in the beginning phase of the earth, required for primitive life to emerge and survive, to the oxidizing atmosphere containing 22% oxygen required for life of higher order, implies that the evolving life has changed the environmental conditions according to its specific requirements. This hypothesis, called “Gaia”, proposed by the British astronomer James Lovelock and further developed by Lynn Margulis, has profound implications to interactions between *jīva* and *ajīva*. The same hypothesis can be extended to the whole universe, wherein the universe can likewise be considered as a mega organism made up of two components: living and non-living in which the “*Brahma*” (or self) dictates all the physical processes to suit its own requirements and that every part of the universe functions for its sustenance. Buddhist cosmology goes a step further by postulating that an “appropriate” universe is created automatically and spontaneously where souls can be reborn to expiate the consequence of their accumulated *karmas*.

Based on various points discussed in this chapter, we find that there is some common ground between modern science and Jainism. Some of these aspects are compared in Table- 7. 1.

Table -7.1: Comparison of some concepts in Jainism and Science

| Jainism | Science |
|---------------------------------|--|
| <i>Karmavād</i> | Causality |
| <i>Anekāntavād</i> | Wave-particle duality, Complementarity, Quantum modes |
| <i>Saptabhangi</i> | Limits of knowability, probability |
| <i>Syādvād</i> | Quantum physics, Uncertainty |
| <i>Parasparopagraho Jivānām</i> | Entanglement |
| <i>Kramabaddha Paryāya</i> | Determinism |

We see from this table that, in spite of much wider scope of Jainism which includes both *jīva* and *ajīva* and relatively limited scope of physics which is concerned only with matter, there are some areas, where they conceptually concur. However, it may be noted that there are many important areas where there are serious disagreements between them. We mention a few such examples here. Jainism asserts that the universe is eternal, unchanging on a gross scale, that is similar to the concept of the Steady State model of the universe, whereas scientific observations indicate that the universe originated in a Big Bang episode, about 14 billion years ago. Whether the universe is a Big Bang universe, Steady State universe or oscillating or cyclic universe is a matter of continuing research and surely new theories will emerge in times to come. Some of these aspects are discussed in the next chapter.

There is an apparent disagreement between science and Jainism as far as the origin of life is concerned. The scientific working hypothesis is that life can arise from matter whereas Jainism considers both, matter and soul, as independent *reals*; one cannot be produced from the other and both are eternal. These concepts

can be reconciled, as will be discussed in Chapter-10, since Jainism propounds that souls abound all over the universe and an appropriate soul will enter a molecular structure if it is suitable, and make it alive. This may apparently appear as an evidence for chemical synthesis of life although in reality it is not so.

Areas of serious disagreement between modern views and Jain concepts relate to geography and astronomy, cosmic cycles, units of time and space. Since these are based on factual data and science has made tremendous progress in observational techniques, Jain concepts need to be reconciled with modern observations. This can be accomplished either by properly reinterpreting the Jain texts or by modifying them by incorporating relevant scientific findings. Some of these aspects are discussed in the next chapter.



CHAPTER-8

Jainism, Mathematics, and Cosmology

Nature did not have to create each and everything.

All it did was to make laws and everything followed by itself.

- *Jain counting system*
- *Asankhyāt and anant*
- *Cosmology*
- *Jain Universe, Kāl chakra*
- *Astronomy, Geography and Pictograms*

Philosophy, culture and mathematics are intimately related to each other and each of them builds upon the concepts of the other as is amply reflected in the ancient Indian thought. According to Jain scriptures the counting system and written script were invented in ancient times by the first *Tīrthankar* Rishabh Dev. The historical roots of ancient arithmetic and geometry are documented in Babylonia (going back to about 5700 BCE), Sumeru (2500 BCE), Egypt (4000 BCE) and Greece (600 BCE) where calendar, weights and measures etc. evolved. But numbers (0 to 9) and the decimal system were conceived in India. These developments gave a powerful tool to ancient Indian mathematicians for developing several new concepts and attaining high level of precision in mathematical calculations.

The conceptual discovery of zero is attributed to the Indian mathematician Pingala (may be about 4th century BCE) and the oldest known text to use *Sūnya* (zero) and a decimal place-value system, is the Jain text titled Lokavibhaga (dated 458 CE). It was later introduced in arithmetical formulae by Aryabhatta (476–550 CE). The decimal system, more than anything else, laid the foundation of modern physics, astronomy, cosmology and computers. Some scholars believe that the discovery of zero owes much to the concept of *Sūnyavād*, an important tenet of both Buddhism and Hinduism. Jains were the first to conceive the idea of infinity and to recognize that there are many kinds of infinities. Indian mathematicians, especially Jains, applied the mathematical concepts of zero, infinity etc. not only to cosmology, astronomy and geography but also to philosophy and culture (see e.g. *Ganit Sar Sangraha*, by Mahviracharya, 9th century CE). For example, the concept of infinity was frequently used in the spiritual domain as some of the attributes of pure soul (*kevalis*) are infinite (e.g. infinite *jnāna*, infinite *vīrya* etc., as discussed in Chapter- 2).

In ancient times, the concepts of decimal as well as the powers of 10 made it possible to handle large numbers and enabled mathematicians to comprehend the vastness of the universe. In many cases they obtained realistic estimates of the dimensions and age of the universe and other large celestial structures. Jains also used schematic sketches of astronomical bodies, as evident from the icons and symbols used by them in their religious rituals. The Jain icon of *swastika*, used as an auspicious symbol, represents the initial shape of a spiral galaxy, such as our Milky Way, as it began to form from a giant cloud of gas and dust. Its arms started forming due to differential rotation of the cloud. The clockwise arms form in a galaxy which rotates anticlockwise and vice versa. Both forms of *swastika* are in vogue, indicating that the ancient Jain thinkers knew that galaxies rotate either way. Thus *swastika* is a symbolic representation of the earliest stage of our origins. Jains also used new moon and sun placed on top of it as a symbol of purity,

indicating that there was a close relationship between astronomy, philosophy and culture.

We do not want to dwell here much on the historical aspects of arithmetic and geometry, except mentioning that many theorems, claimed to have been discovered by European mathematicians, were well known and quantitatively formulated, centuries earlier by Jain mathematicians, as compiled by Mahaviracharya and recently by Jain et al. (2015). We will only discuss some concepts related to Jain numerical system, cosmology, astronomy and geography which may still be relevant today. When we turn our attention to geography, planets, Sun and Moon, we find many descriptions in medieval Jain literature that are inconsistent with the modern observations. Jeoraj Jain (2013) has suggested that the diagrams of the earth and universe etc. as given in Jain texts are not geographical maps but are symbolic pictorial representations, which he calls pictograms. These have been literally and incorrectly interpreted as geographical maps, leading to conflict with modern observations. When decoded properly (Jain et al, 2015), these pictograms seem to agree with astronomical and remote sensing observations. Some of these aspects are discussed later in this chapter.

Jain number system and concept of *asankhyāt*:

The number system evolved by Jains in ancient times enabled them to define elaborate sets of units of time and space. Jain mathematicians used decimal system for calculations but preferred some variations of binary or other *ad hoc* systems (e.g. multiples of 8) in defining units of time and space. Jains divided numbers into three types, enumerable (countable, *sankhyāt*), innumerable (uncountable, *asankhyāt*) and infinite (*ananta*). There are many types of countable (starting with the minimum number as 2), uncountable, and infinite numbers, going up to infinitely infinite (*anantānant*). Muni Mahendra Kumar (2010) has investigated and interpreted these numbers in his book “Enigma of the universe”.

Each of these three types of numbers are divided into three categories; the numerables (positive numbers) are classified as minimim (*Jaghanya*), intermediate or medium (*Madhyam*) and maximum (*Utkarsha*); the three categories of *asankhyata* are termed as *Paritasankhyāt*, *Yuktasankhyāt* and *Asankhyātasankhyāt*; similarly infinite numbers (*ananta*) are divided into *Paritānant*, *Yuktānant* and *Anantānant* (infinitely-infinite); each of these *asankhyāta* and *Ananta* numbers are further sub-divided into three categories: minimim (*Jaghanya*), intermediate (*Madhyam*) and maximum (*Utkarsha*). Thus Jains defined nine types of infinities and the highest level of infinity was the infinitely-infinite knowledge (*kevaljñān*) of an omniscient. Muni Mahendra Kumar (2010) and R.S. Shah (2014) have defined these types of numbers and discussed their importance in quantifying large numbers encountered in physical dimensions (e.g. of the universe) or those which can not be precisely determined as in divergent or repetitive series.

Here we take a different view of *asankhyāt*, which should provide it with some physical significance. In the modern view, infinity is something which has no boundaries. *Asankhyāt* (innumerable) is a unique concept developed in Jainism which defines a number of entities inside a container with flexible boundaries and hence can not be determined precisely. In Jain texts, *asankhyāt* is used in several contexts. For example, it is mentioned that *asankhyāt paramāṇus* make *one aṇu* and it is also used for the smallest units of time (*Samaya* and *Avalikā*) and largest unit of distance (*Rajju*). According to N. M. Tatia and Muni Mahendra Kumar, innumerable *samaya* make one *Āvalikā* (*Āvalikā* = 1.717×10^{-4} seconds). *Āvalikā* is calculated precisely and then abruptly it is equated to indeterminate (*asankhyāt*) number of *samaya*. *Āvalikā* is quite large as compared to the Planck time (10^{-43} seconds), often used in physics and cosmology, in connection with the Big Bang event, during which we cannot determine the state of the universe. On the other hand, innumerable is also used to

characterize sizes of very large objects, such as the universe which, as mentioned in some texts, has a volume of 343 cubic *Rajjus*. A *Rajju* equals innumerable *Yojans* $\times 10^{14}$; *yojan* being a unit of distance (also mentioned in Vedic literature), usually considered to be approximately 12 km (and elsewhere about 12000 km). Thus *Rajju* is indeterminable in an absolute sense although, according to some scholars, it may have a value between 10^{15} to 10^{22} km.

The largest enumerable number, which has a meaningful physical significance, mentioned in some Jain texts is *shīrsh prahelikā*, determined to be 7.58×10^{193} (or elsewhere as 1.87×10^{249}) calculated up to an accuracy of 70 digits (Muni Mahendra kumar, 2010). It is mentioned that there can not be a larger number with any physical significance and therefore counting beyond this number makes no sense. The physical significance of *shīrsh prahelikā* is long forgotten. We try here to determine the largest meaningful number according to modern cosmology and compare it with *shīrsh prahelikā*. The largest object is the universe and therefore the largest meaningful number should be the size of the visible universe defined by the farthest point from where light can reach us over the age of the universe (13.7 billion years). Taking the velocity of light ($= 3 \times 10^8$ m/sec), it is calculated to be a distance of 4.3×10^{26} meters. The volume of the visible universe then turns out to be 3.32×10^{80} cubic meters. On the other extreme, the smallest meaningful size, from physics point of view, is Planck length (1.6×10^{-35} m), below which size is meaningless. We may consider this value as 'unit space' or '*pradesha*', mentioned in Jain texts. The number of *pradesha* in the 'seeable' universe is 8×10^{184} . It is numerically still short of *shīrsh prahelikā*. There can not be much error in this value because all the parameters used, i.e. velocity of light, age of the universe and Planck length, are known reasonably well. The only way a larger physically meaningful number, approaching *shīrsh prahelikā* can be obtained is if the whole universe (including what lies beyond the seeable universe) is much

much larger. It may be mentioned here that some scholars consider *shirsha prahelikā* as a number in units of time and it is a matter of further study.

It is mentioned in *Tatvartha-Rajavartika* that it is not even within the capability of the omniscient to know the *asankhyāt* number precisely. We attach deep philosophical and scientific significance to the concept of 'innumerable' and take the view that it represents number of entities that cannot be determined, not because it is too large to count, but because the dimensional boundaries are variable. We interpret innumerable as a number, small or big, which are indeterminable because the number of entities to which it refers to is changing continuously. Several types of innumerable entities may exist in nature. For example, in view of the particle-wave duality, the number of particles in a box at any instant cannot be precisely counted. We can, therefore, say that they are innumerable (*asankhyāt*). The innumerability of the number of *samayas* in the practical time unit of *avalikā* or number of *yojans* in a *Rajju* may have their foundation in the Special Theory of Relativity (STR). Time and length are relative and not absolute, depending on the frame of reference of the observer and therefore cannot be determined in absolute units. The time dilation in a moving clock and Fitzgerald contraction of length of a fast moving object arise from these considerations of STR. Some innumerable or *asankhyāt* entities arise as a consequence of Heisenberg's Uncertainty Principle discussed in the previous chapter. Heisenberg found that in the case of elementary particles, one of the parameters in the conjugate pairs (energy and time; position and momentum; angular momentum and angle), cannot be measured with absolute precision but only within some finite error related to the Planck's constant (h). This is not because of the limitations of the measuring instruments but because there is some inherent uncertainty introduced by the very process of measurement. This concept of innumerables or indeterminables has been extensively used in the context of Jain cosmology.

Cosmology:

Origins, i.e. origin of life, origin of universe, origin of Earth etc. are fundamental questions of enquiry in philosophy, religion as also in science. The *Nasadiya Sukta* in Rig-Veda (ca. 3000 BCE) ponders over the mystery of origins¹ and illustrates the philosophic depth of thinking, contradictions, uncertainties and complementarity, which are some of the basic tenets of Jain philosophy as also of quantum mechanics, to describe the true nature of the universe.

Scientific observations show that every physical process is governed by certain laws, which are well defined and can be mathematically formulated with precision. Origin of everything that exists in the universe must have followed these laws which are inviolable and should have existed before anything came into existence. The questions that naturally arise are: How did these laws arise and why are the laws as they exist now and not any different? Why are they invariant through time? Are there other universes where the governing laws are different from those applicable to our universe? What makes these laws to be mathematically formulated with precision? What is the relationship between physical processes and mathematics? These questions are not easy to answer, except saying that they are inherent in the very nature of matter. To understand the process of origin or essentially who came first, the universe or the laws, three possibilities exist:

1. The laws existed before the present universe originated.
2. The laws and universe came into being simultaneously.
3. The laws are eternal and so is the universe: They did not originate but have existed since eternity and will continue to exist for ever.

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

The first option implies that the universe originated in accordance with some governing laws and not in an arbitrary, *ad hoc* or casual manner and continues to evolve according to the same laws. This appears logical and is in conformity with observations. If time and laws were created simultaneously (the second option), then time did not exist before the universe came into existence, in which case the question as to what existed before the Big Bang episode becomes irrelevant. If the universe and laws appeared together, i.e. their origins are interlinked, arguably the laws should also evolve with time as does the universe. Observationally we find that the universe has evolved over the ages but laws of physics have remained invariant through time. Various attempts to find even the slightest variation in these laws with time have so far not been successful. Thus these laws are universal and applicable at all times. Whether they will also be destroyed with the universe or survive, we do not know. This possibility envisages that the laws have come into operation spontaneously, *swayambhū*, i.e. they are self created. If this paradigm, that the laws can appear spontaneously is accepted, there would be no problem in creating everything spontaneously. The third possibility is that the universe is eternal, it was neither created nor it will be destroyed. If so, matter (*ajīva*) and life (*jīva*) can also be eternal. This forms the basis of the “steady state theory” of the universe.

To resolve the problems inherent in the first two possibilities, Jainism propounds that certain “entities “ (*jīva*, *ajīva* and other *dravyas*) are eternal and the universe follows the steady state model according to which *jīva* and *ajīva* have always existed as they exist now. There is no origin or creation, either causal or spontaneous. But we know that the universe, the Earth and life on Earth have originated and gradually evolved (Chapter-1) and will be eventually destroyed. In this context, a Buddhist concept is quite appealing and deserves a mention here. According to this proposition, *karmas* of sentient beings are the motivating force for origination of the material universe, or at least the habitable planets including the

earth as well as hell-like or heaven-like habitats. Appropriate habitats and their environments are spontaneously created by nature where the sentient beings are reborn for expiating the consequences of their accumulated *karmas* accrued during their past lives. This proposition makes *karma* the most powerful law.

Jain scholars have given considerable thought to understand the structure of the universe, its shape and size and cosmic cycles. They conceived a variety of infinities, innumerable and the largest and the smallest possible numbers, as mentioned above. It is quite amazing that the precision with which such calculations were made over two millennia ago are comparable to the precision obtainable presently. Unfortunately there is much confusion regarding the values of units of length and time mentioned in various texts so that a comparison with contemporary cosmology is difficult to make. It is likely that these inconsistencies have crept in during oral transmission from one generation of scholars to the next over a period of several centuries before the *Āgams* were formally documented. None the less, it appears that the basic concepts may have survived without distortion. In view of these problems, dimensions of cosmological and astronomical features related to the Jain units of time and space are not discussed here and we confine to a comparison of some concepts.

Modern Cosmology:

One of the core assumptions on which some of the current theories of cosmology have been developed is that the universe is isotropic and homogeneous and is time-invariant (in its gross characteristics), an assumption known as the Perfect Cosmological Principle. Theoretical considerations imply that a static universe is not possible and therefore dynamic models (expanding, oscillating etc.) have been proposed. Before we make an attempt to understand the way the universe originated, it is necessary to define what is meant by universe. One way of defining the universe is that it is the totality of space, time, matter and energy, i.e. universe includes everything. The *jīva* has no role in the modern cosmology (except that it is a chemical product of the cosmos) whereas it is considered to be a powerful and dynamic element in Jain cosmology.

The currently acceptable theory of its origin, well supported by precise observations and theoretical calculations is the “Big Bang” theory but other models are also plausible. According to the Big Bang model, the universe originated in an explosion, about 14 billion years ago. There was nothing before this event; neither matter nor time existed before Big Bang. It may be that Big Bang is only a mathematical artefact of extrapolation back in time. It is not clear what actually exploded, but according to the models, the universe subsequently underwent expansion, cooled and evolved with time at progressively slower rates, and was sequentially controlled by quantum gravity, electroweak and strong nuclear forces. The initial 10^{-43} second, called the Planck time, was the phase of quantum gravity when temperature of the nascent universe was higher than 10^{32} Kelvin. After the Planck time, the universe entered the Grand Unification epoch which lasted till 10^{-34} seconds. Electroweak forces dominated its evolution up to 10^{-10} seconds and were followed by the radiation dominated phase. Thus, in the beginning, conditions changed quickly, within a small fraction of a second.

To start with, there was only radiation which, as space expanded and temperature of the universe reduced, got quickly converted into matter. It took about 100 seconds after the Big Bang episode for the universe to enter the matter dominated phase when the elementary particles were formed. The first to form was quark-gluon plasma (Chapter-7) and leptons. They quickly coalesced to form protons and neutrons, which in turn fused and subsequently interacted with electrons to form atoms of hydrogen, helium and lithium. As the universe expanded and its temperature reduced further, material collected together to form cluster-like structures. With formation of large structures, the cooling process became faster and the matter and radiation, which had filled the universe, separated from each other, and the universe which was initially opaque became transparent. Inside the clusters, gravitational forces became dominant, molecular clouds of hydrogen started contracting and stars of various sizes began to form. Inside the stars, because of high temperatures and pressures, thermonuclear fusion of hydrogen and helium was initiated,

resulting in formation of all the heavier elements we see today. One of the important elements to be formed was carbon which is essential for life. As the universe evolved further, various generations of stars formed, evolved, burnt their nuclear fuel and exploded, resulting in the formation of a variety of objects including our solar system containing the earth. The earth cooled and the organic molecules combined and life emerged. The radiation which decoupled from matter around 300,000 years after the Big Bang episode, cooled and reached the present temperature of around 3K as a nearly isotropic radiation in the infrared wavelength region. This black body radiation filling the universe was discovered about half a century ago and has been measured with high precision by space borne instruments.

One of the major problems with this scenario is that matter and antimatter should have been formed in equal proportion but what we actually see around today is only matter and there is no trace of antimatter. The question that is still unanswered is: where has all the antimatter gone? It may have formed another isolated universe, because matter and antimatter cannot coexist and when they come in contact, annihilate each other instantaneously.

In this way, the universe has been expanding and cooling ever since the Big Bang. In this theory most of the matter was formed in a very short episode, starting at a tiny fraction of a second (10^{-35} seconds) that lasted up to 3 minutes. Thereafter changes in its composition and structure were very slow. It took a billion years for galaxies to start forming. The theory of expanding universe is primarily based on the observations of Edwin Hubble (1889-1953), a pioneer in the field of extragalactic astronomy, that all the galaxies are receding, i.e. moving away from each other. He found that the light emitted by a galaxy shifts progressively towards redder (longer) wavelengths, farther away the galaxy is located from us. According to the Doppler Effect, when a source of light moves away from an observer, the wavelength of light becomes longer, shifting towards red wavelength of the spectrum. Based on the red-shift measurements, Hubble found that farther a galaxy, redder is the light received from it, implying that faster it is moving away from us.

Whereas there is a general agreement among scientists on the expanding universe model, there are competing theories to Big Bang. Cosmologists Fred Hoyle, Hermann Bondi, and Jayant Narlikar, proposed the Steady State cosmology, even though Hubble's observation of expanding universe contradicted it. The expanding universe within the framework of Steady State model requires creation of matter to compensate for the expansion for which no evidence has been found. To accommodate the Big Bang event in the Steady State theory, Narlikar subsequently modified it to a "Quasi Steady State" theory, in which the universe is oscillating. The currently expanding phase of the universe is eventually going to enter a contraction phase and such cycles will repeat. The expanding universe is the current phase of this cyclic Quasi Steady State universe.

Simply stated, the shape of the universe is determined by competition between the outward momentum produced by expansion and the inward pull due to gravity. The rate of expansion is expressed by the "Hubble Constant" while the strength of gravity depends on the density and pressure of the matter contained in the universe. The fate of the universe is then governed by its density; if it is less than the "critical density", which is proportional to the square of the Hubble constant, then the universe will continue to expand forever. If the density of the universe is higher than the "critical density", the gravity will eventually dominate and the

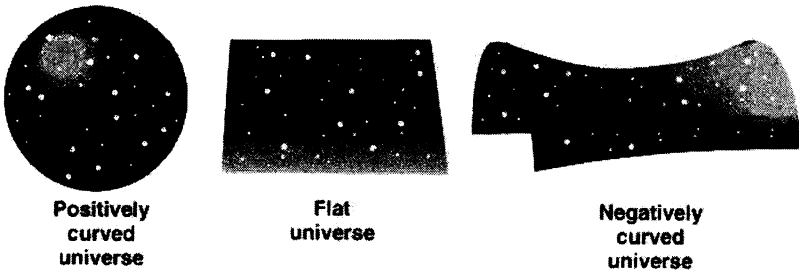


Figure- 8.1a: Various shapes of the universes with positively curved sphere having closed geometry (with critical density $\Omega_0 > 1$), plain flat geometry ($\Omega_0 = 1$), and saddle-like, negatively curved, open geometry ($\Omega_0 < 1$). (figure from Wikipedia).

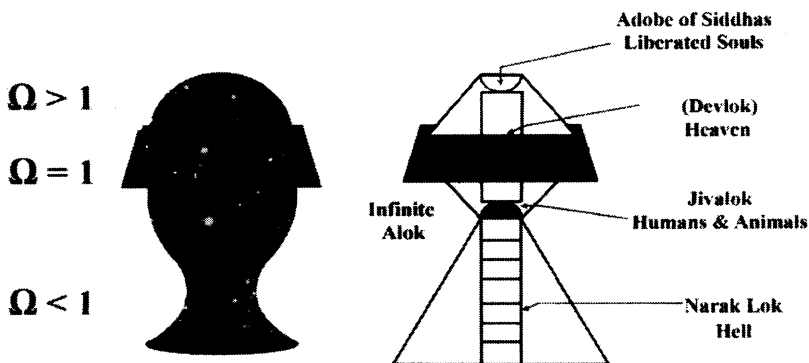


Figure-8. 1b : The three universes with positive, flat and negative geometries, sequentially produced as a triplet, next to each other match the shape of the Jain lokakash (right) as proposed by N.L. Kachhara (2011) .

universe will collapse back by itself into the so called “Big Crunch”. However, a recent study suggests that the expansion rate of the universe is increasing and not slowing down. One way this can happen is if a certain form of matter exists which exerts a strong negative (out ward) pressure. This form of matter is referred to as the “dark energy”. The dark energy is responsible for a short accelerated expansion of the universe during its infancy. If the dark energy were to play a significant role in the evolution of the universe then, in all likelihood, the universe will continue to expand forever. The dark energy, being responsible for motion which led to inflation of the universe, may be likened to *dharmāstikāya* of Jain universe, discussed in the previous chapter.

The density of the universe also determines its geometry; if it exceeds a certain critical density (Ω_0), then the geometry of space is closed and positively curved like the surface of a sphere. If it is less than the critical density, then the geometry of space is open and negatively curved like the surface of a saddle. If it exactly equals the critical density, then the geometry of the universe is flat like a sheet of paper. Thus, there is a direct link between the geometry of the universe and its fate — whether it will continue to expand, eventually contract or will maintain status quo.

Recently the temperature of the universe has been measured using spacecrafts. The density of the universe, based on the observed fluctuations of the temperature of the universe, indicated by the background radiation, is found to be close to the critical density (within an error of 2%) and, therefore, it appears that the geometry of the universe is probably flat, to the extent determined by the errors.

Three points based on astronomical observations may be noted here. Firstly, the universe underwent a phase of rapid expansion early in its history, after the Big Bang, called 'inflation' and has been expanding ever since. Secondly, every celestial object in the universe is rotating, around its own axis as well as around the gravitational centre of the system, be it planets, stars or galaxies. Thirdly, every object in the universe is expanding and contracting, in howsoever miniscule a manner be it the sun, earth or stars. We will discuss Jain cosmology bearing these observations in mind.

Jain Cosmology:

As has already been mentioned, Jainism has divided the universe into two parts - *loka* and *aloka*. *Loka*, containing the six *dravyas*: *jīva*, *pudgal*, *ākāsh*, *kāl*, *dharmāstikāya* and *adharmaṣṭikāya* has finite dimensions, whereas *aloka* is infinite in extent. *Jiva* is synonymous with soul and Jainism propounds infinite number of pure souls, and infinite number of impure souls in the universe. The pure souls are confined to one edge (for convenience labeled as top) of the universe, called *Siddha shila* or the space of purity, while the impure souls, classified by the magnitude and type of their impurity, exist in different regions of the universe, as discussed later. *Pudgal*, some having mass and others being massless, is equivalent to matter and has infinite number of structures. Jain cosmology postulates that *ākāsh* is made up of infinitesimal space units called *pradesha* and *kāl* is made of infinitesimal time units called *kālāṇu*. In terms of modern concepts of physics, as already mentioned, a *pradesha* can be considered to be equivalent

to Planck length = 1.6×10^{-35} meters, which is the smallest 'sensible' distance in view of the quantum gravity. Planck time = 10^{-43} seconds, the time taken by a photon to cross this distance can be considered to be equivalent to a *kālāṇu*, the unit time.

Jain Lokākāsh:

The shape of the Jain universe (*loka*) is quite peculiar (Figure-8.2). Jain *Lokākāsh* is schematically depicted as a hexagon resting on an inverted conical section with a flat base having a finite thickness, as shown in figure- 8.2. In some versions (e.g. *Shvetamber* tradition) the sides of this structure are rounded and smoothened to various degrees. Various parts, from top down, are called *siddha shilā* (space of purity), stated to be the abode of *siddhas*, *ūrdhvaloka* (heaven, abode of *devas*), *madhyaloka* (abode of humans, animals and other living beings), and *adholoka* (hell) respectively. Both, *ūrdhvaloka* and *adholoka*, each are subdivided into 7 distinct regions, as marked by thin lines. In addition, there is *Trasanāḍī* connecting the top of Loka to the bottom, half way along the depth of *loka* as shown in the figure. According to physics, spheroids, ellipsoids, disks and annular shells or annular rings and cylinders have a stable structure in nature whereas trapezoidal or parallelepiped, rhomboidal and conical structures with sharp edges and corners are unstable and can not last long in this shape. Astronomers have observed a large part of the visible universe. They find that only a few structures, like ellipsoids (or spheroids, such as the sun and the various planets) and a disc (such as a galaxy) are stable over long periods of time. Certainly a static, angular, massive object like the Jain *loka* immersed in an infinite *aloka* is inherently an unstable configuration. Therefore, there is no way in which the universe can have this shape. We are, therefore, compelled to take the view that this diagram does not represent the shape, but some other feature of the universe. Some propositions have been made to get an agreement between such a structure (Figure-8. 2) and modern cosmology. We discussed one

possibility involving curvature of space in Fig. 8.1 above. Now we consider two other possibilities here.

1. Some current theories, like the string theory, suggest that the universe may have 11 dimensions, ten of space and one of time, instead of the four dimensional space-time universe. It is difficult to draw a multidimensional object on a two- dimensional paper. The sketch of the Jain *lokākāsh* (Figure- 8. 2) may be projection of a four (or 11) dimensional object (see e.g. P. D. Ouspensky) on a 2- dimensional sheet of paper.

2. For the reasons mentioned above, it is possible that the *lokākāsh* diagram in Figure 8.2 does not represent the actual geometry or structure of the universe but symbolically represents some other features of the universe. We note that it has 11 arms, as marked. This sketch can be understood as representing 11 dimensions of the universe as envisaged in the string theory. It is mentioned in the scriptures that *Trasanādi* serves as a super-fast channel through which a soul can move from one part of the universe to the other, say from *manushya loka* to *siddhashilā* or *devaloka* instantaneously and spontaneously. Therefore *Trasanādi* (marked by T) can be considered to be a wormhole, connecting different parts of the universe as envisaged in the General Theory of Relativity (GTR). In support of this proposition, we discuss below some aspects of our current understanding of wormholes and String theory.

The quantum theory of gravity combines quantum mechanics, the rules governing physics of elementary particles and GTR in which gravitation is dominant. As discussed in the last Chapter, at the minutest level, there are elementary particles of matter (quarks, leptons and carrier particles etc., in all 18 of them) and the three forces of nature (gravitation, electroweak and strong nuclear forces), govern their behavior. Together, these constitute the universe. Can all these be described by a single theory, dubbed as the Theory of Everything (TOE)? Attempts to integrate various

theories of matter and forces into a single theory have so far met with only limited success. String theory, considered to be a good candidate for TOE, appears to have some relevance to the Jain view of *lokākāsh*. We, therefore, summarise some aspects of the String theory here.

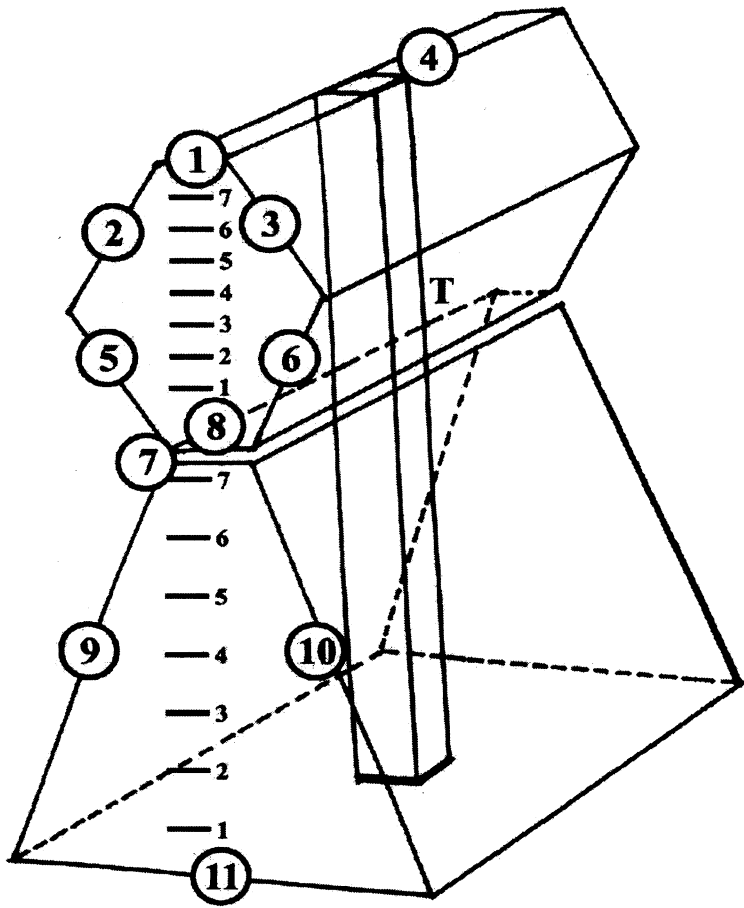


Figure- 8.2: Jain *Lokākāsh* showing its 11 arms, as marked. Each arm may symbolically represent a dimension of the universe and may agree with the string theory (M-theory) which envisages an 11- dimensional universe, with 10 dimensions of space and the eleventh dimension, marked by 4, representing time. The *Trasanādi*(T) is proposed to be a wormhole that connects various parts of the universe.

Space, wormholes and the string theory:

The Jain view of space is that it is completely void, only an abode, giving place to everything that exists in it. It is non-interactive, passive, homogeneous, isotropic, and uniform. It is only a facilitator, which permeates the whole universe, yet not partaking in any process, and remaining unaffected by anything (e.g. matter) present in it. In contrast, according to GTR, space is affected by matter present in it. Space gets curved around matter and, in turn, motion of matter is affected by the curvature of space in which it exists. GTR describes the way matter affects the curvature of space and offers the possibility of space-time wormholes, which are hypothetical objects, that occur when intense gravitational fields warp up both space and time to such an extent that it creates shortcuts from one part of the universe to the other and perhaps also opens up a route from our universe to some other universes. Thus a wormhole is an Einstein-Rosen Bridge, a hypothetical topological feature that would be essentially a “shortcut” through space-time. It is, in principle, like a tunnel with two ends, each end being at a separate point in space-time. If our “universe” is indeed a multiverse, then there could be intra-universe as well as inter-universe wormholes.

In the 19th century, space was considered to be three dimensional: up-down; front-back and left-right. Afterwards time was integrated with space as the 4th dimension. In 1919, Theodor Kalutza showed that if one extra dimension exists in the universe, electromagnetism can also be incorporated with gravity. Thus universe may be five dimensional: four of space and one of time. In 1926, the Swedish physicist Oskar Klein gave a physical interpretation of the extra dimension - it is wrapped up into small circles which are too small to be seen. Therefore, this dimension is unobservable, and effectively we see only 4-dimensional space-time.

The string theory postulates that the fabric of space is such that at the fundamental level, the elementary particles (i.e. electrons and quarks) within an atom are not 0-dimensional point objects,

but rather 1-dimensional oscillating lines (“strings”) that vibrate, resonate and manifest as various particles, depending on their frequency, mutual interaction and presence of nodes. The “superstring theory” proposes that miniscule strands of energy vibrate in 11 dimensions (10 of them related to space and one to time). The extra dimensions, other than the four known dimensions of space-time, have been compressed to extremely small scales so that they are not easily observable.

Looking at the sketch of Jain *lokākāsh*, we find that it has 11 sides (Fig. 8.2). It is possible that this structure is actually a symbolic representation of a 11-dimensional universe. The *madhya loka* is connected to *siddha shila*, *ūrdhvaloka* (heaven) and *adholoka* (hell) via *Trasanādi* for the soul to be able to move swiftly (over time scales of the order of a few ‘*samaya*’) from *madhya loka* to either of these three regions, depending on one’s *karmas*. This is possible only if these regions are connected with wormhole like pathways. Further, it may be noted that the soul cannot move back and forth between any of the four regions without going through *madhya Loka* (i.e. *manushya Loka*), as depicted. Thus, some of the discrepancies between modern cosmology and Jain *lokākāsh* vanish if the *lokākāsh* diagram is not a geometrical figure but its 11 arms represent 11-dimensional universe, consistent with the M-theory.

Jain Kāl Chakra:

Jain cosmology is a Steady State cosmology. It assumes that the universe is eternal, without beginning or end, and has always been, in a gross sense, like as it exists now. To circumvent the problems of formation and destruction of various objects, i.e. earth, planets, stars, and the universe as also civilizations, Jainism postulates cycles of various types within the steady state scenario. These cycles (*kāl chakras*) are considered to be the causes for regulating creation, evolution, sustenance and extinction. Thus in the steady state scenario, many cycles, within bigger cycles exist. This concept of cycles is called the Jain wheel of time (*kāl chakra*).

The largest cycle is divided into two parts, *Utsarpiṇī* and *Avasarpiṇī*; each having a period of 10 *kodākodi* (KK); its value in years is uncertain. Some estimates indicate that 1 KK equals 10^{14} years. Each of them, *Utsarpiṇī* and *Avasarpiṇī*, are further divided into 6 cycles, called 'Ārā'. The periods of the various *ārā* cycles are: 1st cycle - 4 KK, 2nd cycle - 3 KK, 3rd cycle - 2 KK, the sum of the periods of 4th, 5th and 6th cycles is 1 KK. The periods of 5th and 6th cycles are 21000 years each. The value of 10^{14} for KK appears unrealistic because it can not be larger than the age of the earth (4.5 billion years) and definitely not larger than the age of the universe (14 billion years). R.M. Jain (2010) and Bhandari (2010) have made an attempt to rationalise the periods of Jain *kāl chakra* which will be discussed later.

Scientific studies have established several periodic cycles operative on earth. These include climatic cycles, geological cycles and astronomical cycles in the order of increasing periodicities. The important short cycles are diurnal cycle, monthly lunar cycle and annual solar cycle. The longer climatic cycles depend on variations in the solar irradiance received by the Earth. A Russian scientist, Milankovitch found that the solar irradiance changes with (i) the precession of equinoxes (which changes the inclination of the spin axis of the earth) with a period of about 21000 years (being the average of 19 thousand and 23 thousand years when the northern hemisphere is tilted away from the sun and towards the sun respectively) (ii) obliquity of the earth, which depends on the inclination of the earth's axis to the ecliptic (the plane in which earth moves around the sun in its orbit) which changes with a period of 41000 years and (iii) change in the eccentricity of the earth's orbit (which changes the earth-sun distance) which varies with a period of 100,000 years. All these cycles operate simultaneously, sometimes strengthening each other and sometimes annulling each other. The composite periodicities give cycles ranging up to 400,000 years. These cycles have been experimentally verified by climate markers (isotope ratio of oxygen and hydrogen serve

as proxies for temperature) preserved in the deep sea sediments. Since human happiness depends on an equitable, comfortable climate, it seems logical that Jain cycles are climatic cycles, because they are named after a “happiness index” ranging from extreme happiness to extreme unhappiness. It is therefore no coincidence that the two Milankovitch cycles of 21000 and 41000 years agree with the period of 5th and 6th *ārā*. The 100,000 year climatic cycle, however, does not match with the period of 3rd *ārā*. R. M. Jain has argued that the period of third *ārā* is actually 100,000 years and the KK must be defined accordingly.

Kal Chakra

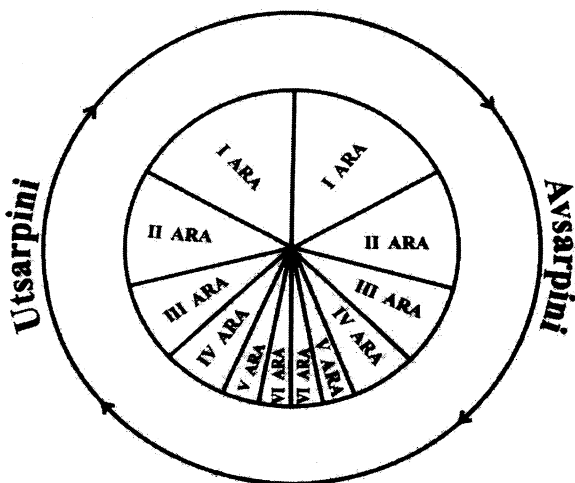


Figure- 8.3: Jain Cosmic cycles

An important geological cycle (probably related to volcanic periodicity) is 33 million years. The sun moves in the galaxy like a carousel, around the galactic nucleus as well as up and down from the plane of the galactic disk. These astronomical cycles, i.e. the motion of sun (together with the earth) in and out of the galactic plane is about 60 million years and rotation of sun around the galaxy is about 250 million years. The sun itself has a life expectancy of about 10 billion years and we are about half way through in its life cycle.

Based on the above discussion we conclude that the climatic cycles on the Earth are firmly based on observations and duly supported by theory. In comparison, the Jain cosmology has many appealing concepts. Both can be reconciled provided the units of time and space used in Jain *kāl chakra* are correctly defined.

Jain Geography:

Besides the structure of the universe discussed above, Jain scriptures have described the geography of the earth, motion of the sun, moon and planets in great detail in *Jambudvīpa Pannati*, *Surya Pannati* and *Chandra Pannati*. Science has made tremendous progress in observational techniques as well as theoretical modeling during the last four hundred years, since Galileo first looked at celestial bodies with his small telescope and Newton enunciated the three laws of motion. Remote sensing by satellite based observations has given us clear picture of geography and motion of the Earth and other planets of our solar system. All the planets of the solar system have been explored by flyby-, orbiting- or landing- missions by American, Russian, European, Japanese, Chinese and Indian planetary missions. Samples of moon, asteroids and comets brought back by space missions and stones naturally falling on earth from moon, mars, asteroids, comets, meteors etc. in the form of meteorites and dust particles have been studied in the laboratory. Thus we have a reasonably good knowledge of the constitution and structure of various bodies of the solar system and their formation as well as evolutionary and chronological histories. Thousands of planets beyond the solar system, termed exoplanets, have also been identified and some of them appear habitable from the point of view of equitable temperature as well as presence of liquid water etc., needed for sustenance of life. In comparison, Jain scriptures describe earth, moon, sun and other planets of the solar system etc. and mention existence of life, in other *dvīpas*, beyond the earth. These descriptions are accompanied with pictorial diagrams, which are difficult to understand. The sketch of Jambudvīpa, presumed to be the earth, as was known in those days, is shown in Figure- 8.4.

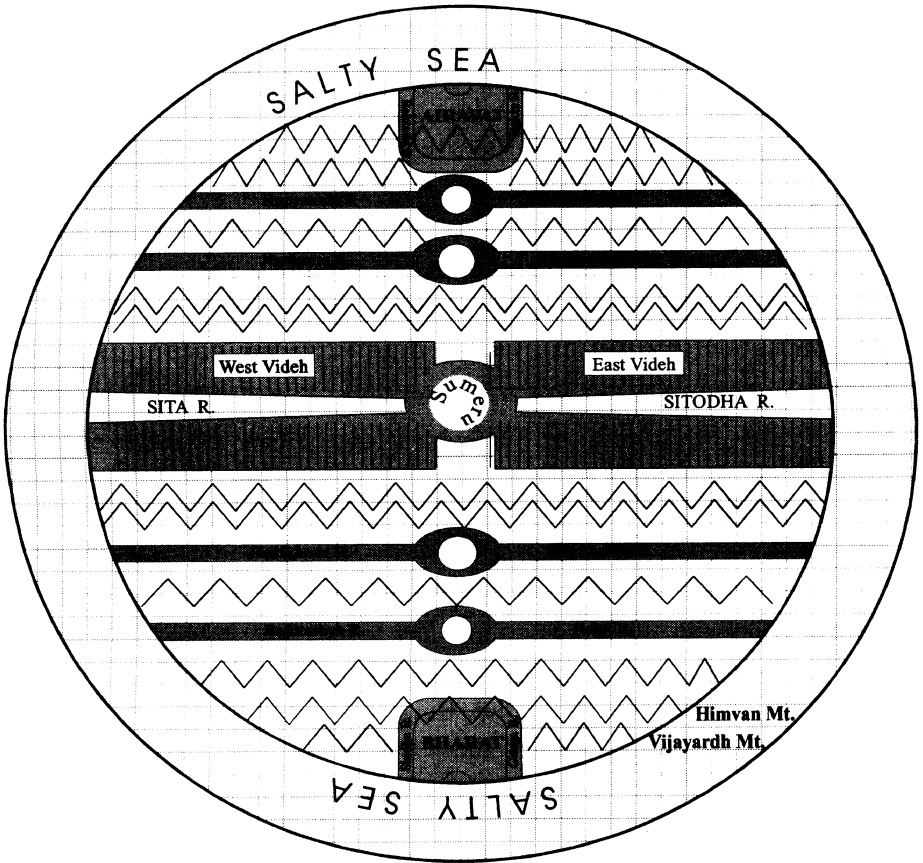


Figure 8.4 : One of the figures from scriptures depicting the earth. It has been wrongly interpreted by several scholars as the geographical map of the earth showing a flat disk shaped earth surrounded by annular salty sea and east and west trending mountains, rivers and continents etc. In our opinion, this figure only depicts some geologic features of the northern hemisphere, specifically 7 mountain ranges, 7 rivers and 7 continental landscapes (forests, deserts etc.), without any relevance to their geometry or relative locations. Only a few names of the rivers (Sindhu, Ganga) and mountain ranges (e.g. Himvan, now called Himalayas) have survived through time. Some minor North-South trending mountain ranges (in the original figure) are not shown here for sake of clarity. Sumeru (north pole) is the axis of the earth around which the spherical earth rotates as shown in Fig 8.5. The Bharat kshetra (India) is located in the southern most region of this hemisphere.

These figures are actually artist's conceptions and pictorial allegorical depiction based on the symbolism prevalent in olden times, giving unrealisitic empahsis to symmetry and ornamentation as pointed out by J.R. Jain (Jain, 2013; Jain et al. 2014). These have been erroneously and literally interpreted as geographical maps, without properly understanding their coding scheme. We discuss three of these drawings (e.g. Figures- 8.4, 8.5 and 8.6) here which have been mistakenly taken to imply a flat, disk-shaped earth, rotating around a *Meru parvat* (rocky axis), alternating annular lands (*dvipas*) surrounded by annular oceans (*lavan samudra*), rivers flowing linearly west and eastward, two suns and two moons, etc. These drawings are accompanied by precise calculations of dimensions of various features and the distance of sun, moon and planets. There is historical evidence in form of maps that during the era of Mahavira (circa 600 BCE), the geography, at least of large areas of the earth, around greater India, was well known. Mahavira travelled through the length and breadth of India and Alexander came to India from Greece soon thereafter, much before the *Āgams* were compiled. Even a lay man would know that the description given above is factually wrong. We must therefore reinterpret these pictograms, not as geographical or geometric maps but as ornamental depiction of certain selected features. To make them consistent with the modern geography, we make an attempt to interpret them in the following way. A sphere is schematically drawn on a sheet of paper as a circle. It must therefore not be taken to mean that the earth is a flat disk. This figure seems to represent the north-polar view of the northern hemisphere; the upper half circle represents the western hemisphere and the lower half circle, the eastern hemisphere, with Bharat Kshetra (India) near the equator. Similarly the other figures (8.5 and 8.6) can be reinterpreted. The two identical suns and two identical moons in the same phase, in Fig. 8.5, are shown on opposite sides of the earth. This may depict actual positions of the only sun and the only moon in the front and

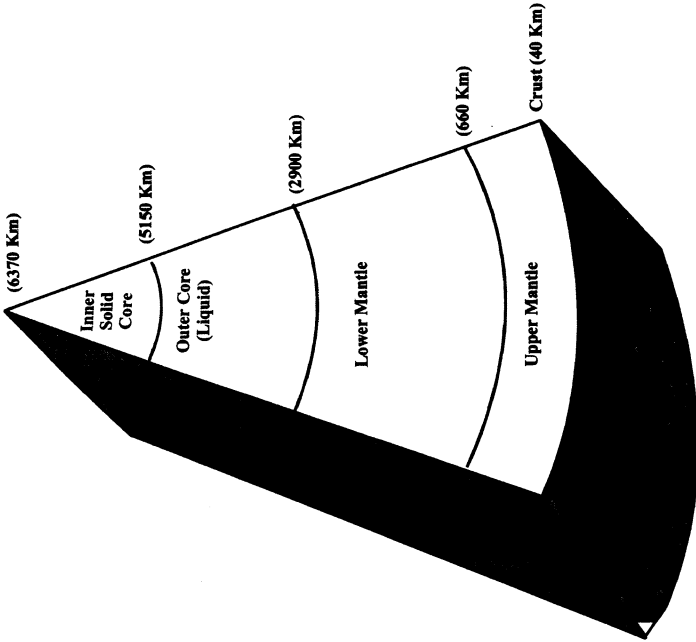
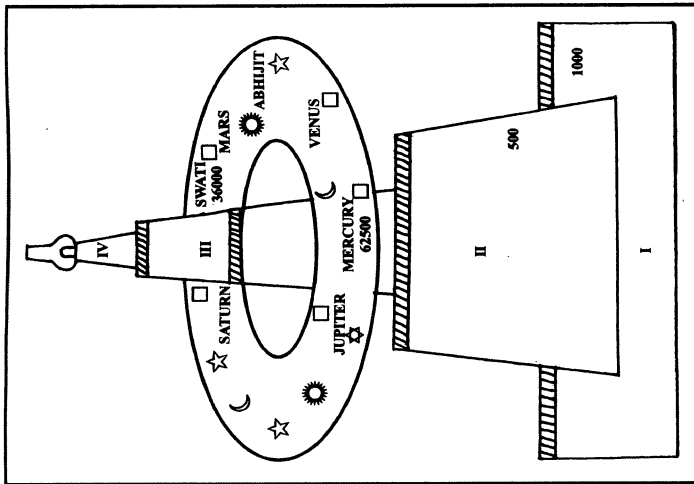


Figure 8.5 : Interior section of the Earth. The symbolic figure from scriptures (left) showing five divisions is compared with the currently accepted section of the earth (right) with five divisions of crust, upper mantle, lower mantle, outer liquid core and inner solid core. The sky is depicted as an annular ring with two suns, two moons, stars (e.g. Abhijit), constellation (Swati) and planets (Mercury, Venus, Mars, Jupiter and Saturn). In our opinion, the conventional interpretation that there are two suns and two moons going round the flat earth, one in the northern part of the disk of the earth and the other in the southern part of the disk is erroneous. Two suns and two moons is the artists way of depicting that the same moon physically revolves around the earth and the earth physically revolves around the same sun. In contrast the planets are shown only once, since they do not revolve around the earth.

back sides of the globe and should not be construed as the earth having two suns and two moons. The Moon and sun look identical from everywhere and it does not seem plausible that the people who invented lunar calendar were not aware of the fact that the earth has only one sun and one moon. In contrast, the five planets¹ (Mercury, Venus, Mars, Jupiter and Saturn, marked by squares) are shown singly and not in pairs like sun or moon. This is the artists way of depicting that the earth does not go around these planets, like it does round the sun, nor the planets go around the earth, like the Moon does. Some stars like Abhijit and Swati are also shown singly for the same reason.

Some Jain scholars have argued for the existence of two moons in the following manner. The earth at times temporarily captures another satellite from the asteroidal belt (or near-earth objects) which accidentally comes too close to it. At present, earth has another companion moon (called object SO16) moving around the earth in a horse-shoe shaped orbit. Such events are quite frequent and earth has occasionally captured another, smaller, moon temporarily in the past. A recent (2011) computer simulation by Eric Asphaug has shown that the earth indeed had two moons in the beginning which merged into one in a slow-motion collision. Most geographic calculations (e.g. durations of day and night) have been based on observations over Jambudvīpa, that is presumed to be greater India, which included part of Europe, south China, Tibet, Burma, Thailand, Indonesia, Srilanka, Afghanistan etc. In Figure 8.6, each continent is surrounded by an ocean (*lavaṇ samudra*), and each successive outer structure is twice the size of the immediately preceding feature. Figure 8.6 may be representing types of other habitable planets, some having seas of oil (*ghritavar*), sweet sugary water (*ikshu ras*), liquid water, milky liquid, salty water, or alcohol

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1. Perhaps the existence of the two outer planets, Uranus and Neptune, were not known at that time.

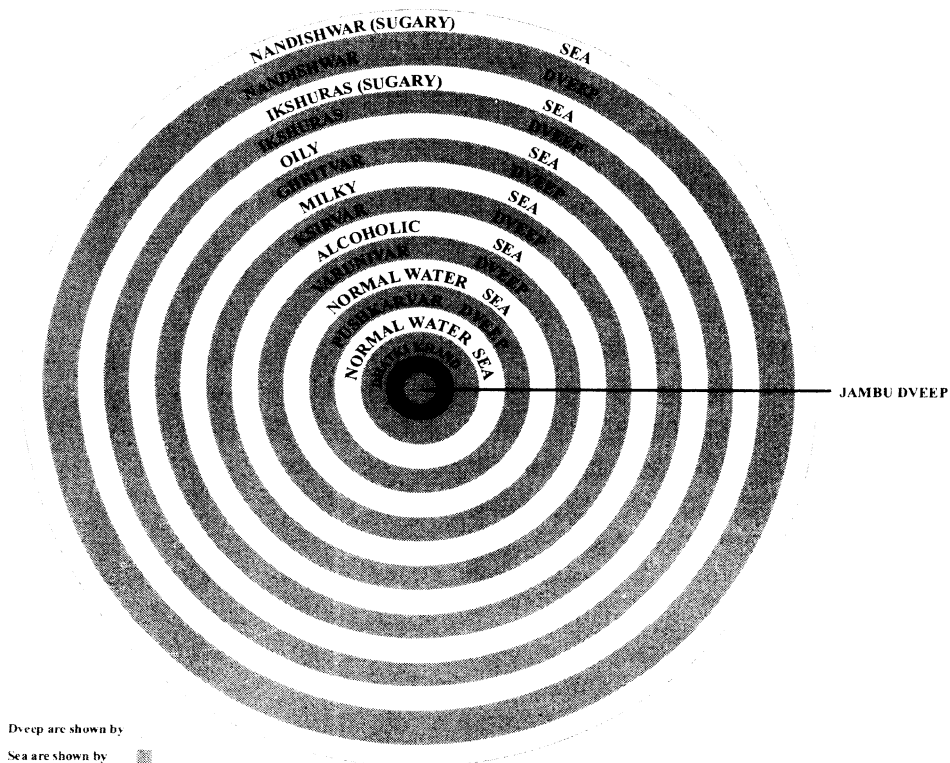


Figure 8.6. Eight habitable planetary bodies as we go away from Earth (Jambu dweep, at the centre) to Nandishwar dweep are shown as annular rings. This has been literally (and erroneously) interpreted as annular geometry of various planets surrounded by annular seas whereas the main purpose of this diagram may be to show the composition of seas around different planets: salty water around the earth, normal water around two planets (Dhataki Khand and Pushkar dweep), alcoholic sea around Varunivar dweep, milky sea around Kshirvar dweep, oily sea around Ghrivar dweep and sugary sea around Ikshuras dweep. The largest planet is Nandishwar dweep, surrounded by sugary sweet sea. Water has been discovered recently on satellites of Jupiter (e.g. Europa and Ganymede) and Saturn. Recently some planets with calcium-rich water (appears milky, because of the dissolved calcium carbonate), planets and seas containing organic oily-tar like material have been discovered. Some planets or satellites (Titan, e.g.) have abundant organic matter and low temperatures so that lakes or seas of methane or ethane or alcohol exist there. Around a star Rho Ophiuchi, organic sugars (glycoaldehyde) have been detected. Comets are also known to contain alcohols and sugars.

(*dāru*) etc. Planets with these types of composition (alcohols, sugars, oil) have been recently discovered. Titan, the satellite of Saturn has lakes or seas of liquid methane and ethane, as found by NASA's Cassini-Huygens probe. It may be noted that the ratio of the land area of Jambudvīpa to the surface area of the saline ocean (1:2) seemingly agrees with the earth where land area is roughly 1/3rd and ocean is 2/3rd of the total area of the earth and the land to ocean area is 1:2. Some planets in the solar system, satellites of Jupiter (e.g. Europa, Callisto and Ganymede), and of Saturn (e.g. Enceladus), and some exoplanets, outside our solar system, and comets, asteroids etc. have been found to contain either sweet or saline waters and some organic chemicals (e.g. sugars, alcohols, and tarry-oil like substances).

In this chapter, we have discussed some aspects of Jain cosmology, astronomy and geography and pointed out serious discrepancies between current observations and traditional interpretations of Jain texts. Even so, some concepts in Jain cosmology and astronomy appear logical and appealing and are supported by scientific evidence. In spite of severe difficulties, it requires rational understanding of the diagrams given in Jain texts and further study is desirable.



CHAPTER-9

Theory of Association and Dissociation

(*Vargaṇā*)

Everything in the universe is a result of association and dissociation.

- > aggregates, *vargaṇā*
- > nuclei to atoms to planets
- > strong, electromagnetic and gravitational forces
- > physical and bio-*vargaṇās*
- > formation of mind and speech
- > *sūnya vargaṇā* and dissociation

The universe has formed as a consequence of association of some basic constituents (e.g. *paramāṇus*, *ātmā*) and dissociation of aggregates thus formed; The cycle of both these processes, association and dissociation, have been going on without interruption since eternity. The processes of association and dissociation are central to Jainism. The association of soul with *karmāṇus* leads the soul to manifest in various *yonis* and dissociation or shedding of *karmāṇus* leads to *moksha* (liberation from the cycle of birth and death) which is the ultimate goal of all living beings.

Synthesis of aggregates:

In the material world, in accordance with the laws of physics, association and dissociation occur at various levels. There are two types of entities in the material universe which are mutually inter-convertible: matter and energy. They interact with each other and

form aggregates under the influence of certain forces, as discussed in Chapter- 7. Matter can exist in any of the two forms, massless or with mass. At the smallest level, matter exists as quark-gluon plasma and as elementary particles (e.g. hadrons, leptons, and the force carrier particles, see Chapter-7). They combine to form protons, neutrons etc. The process of their combination and disintegration is governed by nuclear forces, i.e. strong and weak interactions. These forces are governed by the laws of physics. At the atomic and molecular levels, i.e. in formation of ions, molecules, compounds and minerals, the processes occur due to electromagnetic forces and these types of associations and dissociations are governed by the laws of chemistry. Modern chemistry postulates various types of electric bonds, depending on the nature of the electronic structure of elements (ions) and their valency. Combinations of tetravalent carbon containing molecules with other elements can lead to large complex molecules like proteins, amino acids and nucleotides. It is believed that these molecules can ultimately lead to formation of bio-molecules as well as simple types of living cells. These cells undergo Darwinian evolution, by interaction with their environment. Thus modern science postulates chemical synthesis of living from non-living. Functional DNA (deoxyribonucleic acid), a hereditary molecule, vital to replication and survival of the cell, has been synthesized but it has not been possible to demonstrate that living cells can be chemically created and, therefore, so far this merely remains a hypothesis. This postulate does not require the existence of soul, although Jain theories indicate that when any chemical structure is suitable, an appropriate soul can enter it and endow it with life.

As far as physical matter is concerned, for large masses, gravitation plays a dominant role and formation of planets, stars, galaxies and very large structures including the entire universe are primarily governed by gravitational force.

Jain view on synthesis:

According to Jainism, a body has multi-layered structure; the physical body is its gross form and the *kārman* body is the subtle

form, as mentioned in Chapter-5. The various *vargaṇās* can form five types of bodies, viz. *Kārmaṇ* (causal), *Tejas* (energy), *Āhāra* (conscious), *Vaikriya* (form) and *Audārik* (physical). These five types of bodies are formed from five types of aggregates, known after their names, i. e. *kārmaṇ vargaṇā*, *tejas vargaṇā*, *āhāra vargaṇā*, *vaikriya vargaṇā* and *audārik vargaṇā*. Besides these five *vargaṇās*, three other important *vargaṇās* are *mano vargaṇā* (mind *vargaṇā* responsible for formation of mind), *shwāsochhavās* (breathing) *vargaṇā* and *bhāshā* (speech) *vargaṇā*.

Ajīva and *jīva*, both are important constituents of the Jain Universe. The *paramāṇu* and soul are the smallest, indivisible, basic *dravyas*, independent and distinct entities. Neither of these form from the other, but none the less, they interact with each other, giving rise to the formation of all objects in the universe by association and dissociation. It begins with the dimensionless *paramāṇus* that form clusters which grow sequentially. These clusters or aggregates (*skandhas*) are termed as *vargaṇās*. The number of *paramāṇus* in clusters is generally very large, approaching infinity. As the combination of matter proceeds, aggregates are formed and when they exceed a certain critical number or mass, qualities of consciousness, mind and speech can be acquired by interaction with their respective *vargaṇās* (*āhāra*, *mano* and *bhāshā*). Thus the Jain theory of *vargaṇā* involves step-wise, sequential advancement for acquiring various qualities that are present in both, *ajīva* and *jīva*.

Vargaṇās:

Although there are large number of different types of *vargaṇās*, Jainism postulates 23 main *vargaṇās* as follows:

1. *Aṇu vargaṇā*
2. *Sankhyatāṇu* (numerable) *vargaṇā*
3. *Asankhyātāṇu* (innumerable) *vargaṇā*
4. *Anantāṇu* (infinite) *vargaṇā*
5. *Āhāra vargaṇā* – for *audārik* (gross), *vaikriyic* (fluid) and *āhāra* (transitory) bodies

6. *Agrāhya* (non-associable) *vargaṇā*
7. *Tejas vargaṇā* – for acquiring the *tejas* body
8. *Agrāhya* (non- associable) *vargaṇā*
9. *Bhāshā vargaṇā*- for acquiring faculty of speech
10. *Agrāhya* (non- associable) *vargaṇā*
11. *Mano vargaṇā* - for formation of mind
12. *Agrāhya* (non- associable) *vargaṇā*
13. *Kārmaṇ vargaṇā*- for formation of *karmaṇ sharīra*
14. *Dhruva* (permanent) *vargaṇā*
15. *Santer nirantar* (discontinuous-continuous) *vargaṇā*
16. *Dhruva sūnya vargaṇā*
17. *Pratyek sharīra vargaṇā* – used for making immobile life forms (e.g. plants)
18. *Dhruva sūnya vargaṇā*
19. *Bādar nigod vargaṇā*
20. *Dhruva sūnya vargaṇā*
21. *Sūkshma nigod vargaṇā* – for *Audārik, tejas & kārmaṇ* bodies of *sūkshma nigod jīva*
22. *Dhruv sūnya vargaṇā*
23. *Mahāskandha vargaṇā* – all large structures of matter are made of this *vargaṇā*.

It is further mentioned in Jain scriptures that *vargaṇās* 1 to 14 are permanent, continuous and massless and have four attributes (termed as senses of touch, smell, taste and color). The massless *vargaṇās* have energetic associations and have specific functions, such as in construction of the invisible bodies of organisms and supporting various life functions. The remaining types of *vargaṇās* deal with particles having mass in which the *paramāṇus* are bonded together. The 5th to 14th *vargaṇās* are formed by combination of lower *vargaṇās* or dissociation of higher *vargaṇās*. One of these

vargaṇās is described as *sūnya vargaṇā*, probably implying dissociation. The inter-convertibility among 15th to 23rd *vargaṇās* is difficult. The last one, i.e. 23rd type of *vargaṇā*, is supposed to encompass all large structures in the universe. The description given above has some interesting features but the way aggregates are formed, starting from the smallest constituents of matter, is at variance with the scientific concepts, as will be discussed later. We first discuss the role of each of the *vargaṇās*.

The smallest material entity is *paramāṇu* which is dimensionless, cannot be further subdivided, and possesses high energy. One to infinite numbers of *paramāṇus* can exist in one “unit” of space (*pradesha*). *Paramāṇus* must, therefore, be bosonic in nature. Clusters containing a very large (innumerable) number of *paramāṇus*, form atoms known as *aṇu vargaṇās*. Thus an atom is made of innumerable *paramāṇus*. In accordance with the concepts of modern physics, the association of *aṇu vargaṇās* must be governed by nuclear forces. The second category consists of *skandha* or composite bodies, which contains two to innumerable *aṇus*. This may be compared with molecules and compounds, which may have two atoms (as in inorganic molecules like O₂, N₂, H₂O etc.) to innumerable atoms (as in long chain organic molecules of proteins, amino acids, sugars etc.). These combinations must be governed by electric forces (valencies and bonds). The third category comprises composite bodies, consisting of innumerable atoms. These bodies may be compared to minerals which are made up of innumerable molecules. When infinite number of atoms combine, large structures (planetary bodies, stars, galaxies etc.) are formed, which come under the fourth category, controlled predominantly by gravity. These four *vargaṇās* can form everything in the universe (except *jīva*), and represent a progressive theory of association from the smallest *paramāṇu*, to molecules, minerals and astronomical structures in which the four forces of nature, viz. strong (nuclear), weak, electromagnetic and gravitation play dominant roles.

But to form *jīva*, which is endowed with the faculties of consciousness, speech, breathing etc., additional specific interactions are required. The above four categories, formed due to nuclear, electromagnetic and gravitational forces, are incapable of being attracted, assimilated and transformed by psychic forces. To provide them with psychic attributes, *āhārak vargaṇā* (5th *vargaṇā*) is required which results in *āhārak* (conscious) body. This interaction requires an infinite number of *aṇus*, to provide it a quality defined as “associability”, which provides matter with psychic attributes. This conscious *vargaṇā* also develops capability of *vaikriya* (transformation of shape and size of a body) and *shwasochhavas* (breathing). The next (6th) *vargaṇā* is defined as the first non-associable (*sūnya vargaṇā*) category. The 7th, i. e. *tejas vargaṇā* results in association of energy with matter and leads to *tejas* body, which provides energy required to perform various metabolic functions, paving the way to form the animate world. The next category (8th) is another type of *sūnya vargaṇā*. Further association leads to *bhāshā vargaṇā* (9th) to enable it to develop the faculty of speech, which is also followed by *sūnya vargaṇā* (10th). The next association leads to *mano vargaṇā* (11th), required for formation and functioning of mind. This interaction may enable neurons present in brain to get organized and initiate their functioning. This is also followed by *sūnya vargaṇā* (12th). The next association involves *kārmaṇus* (*kārmaṇ vargaṇā*, 13th) which form the *karmaṇ sharīra*. Thus most functions of the living beings are realized by a progressive sequence of aggregates mentioned above.

The 14th to 22nd *vargaṇās* are described below. Some of these are responsible for dissociation, rather than association. These are followed by the last *vargaṇā*, called *mahāskandha vargaṇā*, responsible for the formation of large structures, for which all forces and interactions in nature simultaneously play a role. These structures pervade the entire universe.

The four *sūnya vargaṇās* have been variously interpreted by different scholars. According to some opinions, they do not necessarily result in the formation of new aggregates. We have made an attempt to interpret them in terms of the well known laws of physics, as the *vargaṇās* which destroy (annihilate or break down) the aggregates. The first non-usable or non-associable *vargaṇā* (6th) may be considered, based on similarity with physics, as antimatter, which interacts with matter, annihilates it and transforms it into radiation. Likewise every alternate *vargaṇā* after the 7th, i.e. 8th, 10th and 12th, are non-associable, that is they dissociate the psychic aggregates of *tejas*, *bhāshā* and *mano-vargaṇā* associations. By their interactions, the faculties of metabolism, speech and mind are destroyed.

From the laws of physics we know that when energy is not adequate and radiation interacts with radiation (e.g. photons with photons) or when energy interacts with energy (e.g. sound waves with electricity), no new forms of aggregates are formed. In some cases, when a particular type of matter interacts with another type of matter, shape and size of both may change but a new form of matter may not be produced. Only when matter interacts with radiation at high energy new aggregates may be formed. Thus energy, consciousness, mind and speech *vargaṇās* interact among themselves but do not lead to formation of new types of aggregates; only when they interact with matter *vargaṇās*, they develop associability and result in new types of aggregates.

The 15th *vargaṇā* is termed as discontinuous-permanent *vargaṇā* which may represent wave-particle duality. The 16th permanent *sūnya vargaṇā* may imply that all associations are permanently destroyed, as in the case of pure souls. Thus we see that 1st to 6th aggregates are related to matter, 7th to 13th to mental faculties and 17th to 22nd to consciousness. The last, i.e. 23rd *vargana*, embodies all large scale structures like planets, stars, galaxies clusters etc., that exist in the universe.

Modern physics and chemistry deal with combination of matter with matter. Combination of the known minutest particles, i.e. quarks and gluons, protons, neutrons, electrons etc., which results in the formation of atomic nuclei falls under the realm of nuclear physics. Formation and conversion of atoms to molecules and then to compounds (and minerals) falls in the domain of chemistry (electromagnetic forces), although physical processes are also involved in this transformation. Formation of large scale structures (planets, stars, galaxies etc.) is primarily governed by gravitation and other forces generally play a minor role.

It is a challenging task to reconcile the theories of modern physics and chemistry with the Jain theory of *vargaṇā*, except noting that 7th to 22nd *vargaṇās* deal with certain aspects of psyche, consciousness and soul which have not been considered by scientific theories. Thus, the Jain theory of combination deals with the interaction of a soul with another soul, soul with matter, and matter with matter and is, thus, wider in its scope compared to science.



CHAPTER-10

Jainism and Biology

Living organisms are a miracle of nature

➤ *Biological principles*

➤ *Birth and death*

➤ *Rebirth*

Jain scriptures have given considerable thought to physics, mathematics, cosmology, geography and chemistry, as described in Chapters-7, 8 and 9. However, biology, especially functioning of human mind, is central to Jain philosophy, because the prime objective of Jainism is related to living beings i.e. their well being as well as liberation. The emphasis of Jainism is, therefore, quite different from that of modern biology and, except for some basic concepts, there is not much overlap between them. As mentioned in Chapter-2, Jainism postulates a multi-layered (causal, energy, conscious and physical) structure of body which every living being possesses. Various *chakras* (energy centers) related to the human body have been mentioned in Chapter-6. Jain practices, in which considerable importance is given to meditation and *prāṇa shakti* (respiration energy), play a vital role in the process of activating these energy centers, which helps in energizing and awakening *kundalini* carrying the energy to *Sahasrar chakra* and enhancing the consciousness level of the practitioner.

The Jain approach is based on ten physical forces and five psychic forces which will be discussed later. Jainism has, in this way, developed suitable procedures for enhancing the consciousness levels in a holistic way, considering the physical, psychic and spiritual aspects together. The scope of Jain biology, thus, appears to be much deeper compared to the modern biology, which is only concerned with physical aspects. A few aspects of Jain biology, however, may appear irrelevant or inconsistent with the modern concepts. It should, however, be mentioned that Jain scholars have excelled in propounding several concepts related to the living beings much before the advent of modern biology. For example, about 2600 years ago and possibly even earlier (going back to the times of Tirthankar Rishabhdev), the Jains established that plants also have life and can even communicate, a fact discovered by modern science only a century ago.

Rigorous definition of life has been rather elusive. Although we can identify and categorize animate lifeforms very well and clearly distinguish them from inanimate forms, modern science as also various philosophies have not been able to provide a rigorous definition of what precisely constitutes life. According to G. R. Fleishaker, life is self bounded, self generating, self perpetuating, and is endowed with a self sustaining chemical system capable of Darwinian evolution, i.e. undergoing mutation by the process of natural selection. According to Jainism, life is defined by properties (powers) of soul, specifically consciousness, as discussed in Chapter-2, i.e. “one who knows is living”, and it also exhibits some characteristic external attributes like reproduction, growth, a well defined metabolic system, response to external environment, and adaptation to the ambient environment. However, apparently, some of these attributes can be found in physical and chemical non-living (organic as well as inorganic) entities as well, making it difficult to rigorously define life.

Many books e.g. Zaveri and Muni Mahendra Kumar (2009) exist on physiological, psychological and evolutionary biological

concepts mentioned in Jain scriptures and their comparison with modern biology. Instead of revisiting them, we confine here to some basic principles which are specific to Jainism. These can be summarized as follows:

1. Every living species has a soul (*ātmā*) and no life is possible without a soul. Living beings arise by combination of soul together with its associated *karman sharira* with organised chemical structures, capable of forming a body. There are two reservoirs in the universe containing infinite number of souls: Nigoda, having elementary, lowest level of consciousness and only one sensory mechanism of touch, permeate all over the universe, and pure souls, having infinitely high level of consciousness, located in the 'space of purity', *Siddha shilā*, confined to one edge of the universe. A soul, according to its accumulated *karmas*, selects an appropriate molecular structure, enters it and endows it with life. When the structure becomes unsuitable and can not sustain life, the soul leaves it and the body turns into a non-living entity. This cycle goes on till all the *karmas* are shed, the soul becomes pure and moves to *Siddhaloka*.
2. Biologists are trying to synthesise living cells from chemicals in the laboratory and have met with limited success to the extent that a working DNA has been chemically synthesised which, when injected in a living cell, performs all its functions. But according to Jainism, *ātmā* and *pudgals* are independent *dravyas* and one can not be synthesised from the other i.e. non-living matter can not be converted into living and vice versa. When and if a functioning cell is synthesised chemically, the biologists will claim that they have created life but Jains will explain it by the mechanism mentioned above, in which a soul, from an infinite reservoir in the universe, enters a chemical/molecular structure and makes it alive.

3. Jainism has classified living species according to the number of sensory faculties they possess viz. touch, taste, smell, vision and hearing. These are: one-sensed (e.g. plants), two-sensed (e.g. worms), three-sensed (e.g. ants), four-sensed (e.g. butterflies), and five-sensed (e.g. mammals, humans). To this may be added the faculties of speech and mind, which are fully developed in humans and distinguishes them from other mammals. The number of senses possessed by a living species, defines its level of consciousness.
4. The theory of *karma* is applicable to all species (including plants and other types of species, possessing different number of senses organs) and all are treated at par, and are governed by the same laws.
5. According to Jainism, all species have existed in the universe at all times. The Darwinian theory of evolution, on the other hand, implies that the life evolved in a gradual, progressive manner, from unicellular organisms to humans in the 3.5 billion years of earth's geologic history (Chapter-1) and that all the species were not present simultaneously at all times in the past. The two concepts, however, can be made consistent if life is not confined to earth but is spread throughout the universe at different stages of evolution.
6. Jainism firmly believes in mutual dependence of all species as stated in the famous sutra '*parasparopagraho jvānām*', discussed earlier in Chapter 7.
7. Jainism considers substances like air, earth, water and fire (energy) as potentially living and conscious (*sachitta*) entities, when they acquire some particular structures, while scientists classify them as chemical, non-living entities. This is a very profound concept since molecules in air, earth, water etc. do not stay as free, individual, independent molecules but, given adequate time and undisturbed conditions, tend to form groups

or structures, as discussed by Jain et al., (2015). These structures are considered to be *sachitta* because, according to Jain concept, when such structures become suitable, an ambient soul enters them and endows them with life. Transformation from *sachitta* to *achitta* i.e. potentially conscious to inanimate forms occurs at the slightest disturbance like vibrations or heating, by which the structures are broken and become unsuitable for sustaining life. This concept of *sachitta* chemicals is related to the origin of life and formation of an infinite, one sensed (touch) reservoir in the universe, called Nigoda.

8. Jainism propounds the existence of soul in all living beings and in rebirth. Transmigration from one body to another is one of the corollaries of this postulate.
9. The phenomenon of rebirth explains the apparent inconsistency between deeds and destiny of different beings in the current life-time within the framework of *Karmavād*, (Chapter-4). The theory of *karma* implies that the destiny is the direct consequence of accumulated actions (*karmas*) in the past lives (*sanchit karmas*) as well as the current life (*arjit karmas*). Instantaneous, one to one, correlation between deeds and destiny in the current life does not always exist and can be explained by delayed correlation over several lives having continuity of soul (Chapter-4).

One of the points mentioned above that substances like air, earth, water, energy and plant kingdom should be considered as potentially living and conscious entities have far reaching consequences. It essentially implies that nothing, in principle, is non-living, although under certain conditions it may become inanimate. This is similar in concept to the *Gaia hypothesis*, briefly mentioned in Chapter-7. which proposes that the whole earth is a living organism. We discuss this concept further in context of Jainism.

The GAIA hypothesis:

The Gaia hypothesis, propounded by James Lovelock and further developed by Lynn Margulis and others, postulates that organisms interact with their immediate inorganic surroundings on earth to form a complex, self regulating system that strives to evolve suitable conditions as required for sustenance of life on this planet. The biosphere and the various lifeforms evolve to maintain stability of temperature, ocean salinity, oxygen in the atmosphere and other environmental factors that govern the habitability of earth. Thus, Gaia hypothesis suggests that organisms co-evolve with their environment, that is, they influence the abiotic environment around them, which in turn influences the biota by the Darwinian evolution. In this way the evolution of life and its environment are intricately intertwined and affect each other. All lifeforms on earth are considered part of one single living planetary being, called *Gaia*. It is based on the observation that all organisms are made up of both animate and inanimate constituents, i.e. biological as well as chemical components. Likewise the earth comprises animate and inanimate forms, both of which evolve in tandem and harmony (inter-dependence) and provide conditions that are conducive for life to evolve and sustain. We can thus consider the whole earth to be a single conscious macro-organism. The argument can be further extended to the whole universe, which is made up of both conscious (animate) and material (inanimate) components.

The Gaia hypothesis is supported by some features of natural changes, as discerned from geological records. Earth has not remained the same, as it was in the beginning. Significant changes in biotic as well as abiotic processes have occurred periodically. Chemical or inorganic environment as well as biologic processes have occasionally undergone significant and abrupt changes. When the earth was formed and life began on it, the initial atmosphere had large amount of hydrogen, and the environment was chemically reducing, consisting of hydrides of carbon, nitrogen, oxygen (i.e.

methane, ammonia, and water) etc. Free oxygen, which is now vital for our survival appeared in the atmosphere much later, half way through the age of the earth, about 2.2 billion years ago. Large scale sudden fluctuations in carbon dioxide level in the atmosphere have been observed from time to time. Even catastrophic natural geologic events, such as widespread volcanism, asteroidal and cometary impacts on earth, and sea level fluctuations caused by changes in the ice volumes on continental glaciers as well as polar ice sheets, apparently caused severe stress on lifeforms, but each time life invariably overcame such stressful epochs and emerged stronger, adapting to the emerging extreme climatic situations. Thus, in the long term, these changes have catalysed the evolution of life not only in terms of its physical attributes but also in raising the level of consciousness. It is recognised that fire (energy), matter (nutrients, calcium, phosphorus, iron, silicon etc.), water (blood, for example) and air (*prāṇa*, oxygen, and carbon dioxide) are required for sustenance of the biosphere. They all function synergetically, and interdependently, and are in delicate equilibrium with each other. The fossil records preserved in deep sea sediments, as well as geological records, can be taken to imply that the sun, earth, ocean and atmosphere have changed to meet the evolutionary requirement of living species. This observation has given rise to the notion that both living and non-living entities essentially function and evolve in a cooperative, synergetic manner.

The inorganic materials like air, earth and water, or energy by itself, may not be endowed with “life” in the strict sense of the word, as modern biology and medical science imply, but, it may not be incorrect to say that when they act in synergy with biosphere or with living species, these “*achitta*” entities act consciously and develop some kind of wilful behaviour. When non-living matter, such as calcium, magnesium, iron and other chemicals present in our body, or the molecules of air we breathe, become part of the body metabolism, it becomes “*sachitta*”. This concept is quite

revolutionary. Rigorous scientific evidence for Gaia hypothesis is lacking and further studies are required to establish its validity, particularly if the inorganic substances indeed have some kind of “conscious behaviour”.

Jain view on Reproduction:

In Jainism, much thought has been given to the process of reproduction which involves both the usual processes of sexual (from eggs as well as from womb), and asexual conception by pollination etc. Jainism postulates that souls at higher level of purity (in the state higher than *Guṇasthān*- 6; Chapter-5) are born by some uncommon, supernatural, asexual process. There are many anecdotes related to the birth of enlightened souls. According to Acharāṅga and Kalpa Sūtras, the fetus of Mahavira was transferred from a Brahmin woman, Devananda, to a Kshatriya queen, Trishala. Similarly, Christ, regarded as the son of God, was born to Mary, the virgin. Lord Rama and his three brothers were born by performing *yajna* by King Dasharatha. Karna and some of the Pandavas were conceived by Kunti from Sun God. It is mentioned in *Mahāvastu* that Gautam Buddha, over the course of his many lives, developed supernatural abilities including a painless birth conceived without sexual union between his parents. Buddhists also claim “spontaneous appearance” (*swayambhū*) of Bodhisattva Padma Sambhava from a lotus flower that bloomed in a lake in the Copper mountains. We do not know if there is a scientific justification behind asexual conception or transfer of fetus. An intense debate on the relative importance of genetic, epigenetic and external factors in development of a child, has been going on. The importance of epigenetic factors as a reason for transfer of the fetus of Mahavira from an ordinary woman to a Royal queen (Samani Unnat Prajna, 2014) has been proposed. The point is that Mahavira could have been a *Kevali* or *Siddha* by virtue of purity of his soul, resulting from his genetic make up, but became an *Arihant* (who could deliver enlightened and logical discourses)

because of epigenetic factors. It is said that Indra wanted to learn the path to enlightenment and therefore he planned for transfer of his fetus from an ordinary house hold to a royal environment, so that Mahavira could acquire scholarly skills required for preaching.

Biology has made tremendous progress in the past few decades, employing techniques of molecular biology, genetic engineering and determination of genome sequence of different species, and chemical synthesis of a functional DNA, the hereditary molecular chain. It has been established that physical and mental conditions or general health of a living being depend on the genome sequence which one is born with, a concept close to the *kārmic* concept of Jainism. There is considerable scope of research in biology keeping in view the various Jain concepts. If these concepts can be clearly formulated, the techniques of modern molecular biology can provide a rigorous scientific basis for their validity. For example, the proposition that *kārmaṇ sharīra* determines the genetic structure, i.e. the sequence found in DNA which is inherited, can be verified.

Furthermore, it will be interesting to know if following the various Jain practices (*sādhanā*, i.e. *tapas*, *mantras* and meditation or rigorous adherence to the five *mahāvratas*, discussed in Chapter-6) can indeed modify the genome sequence in the long run. The relationship between *paramāṇu* and *karmāṇu*, the influence of *karmāṇu* on genome and whether *karmāṇus* operate at the molecular level or at more subtle levels, are some pertinent questions which can be addressed with modern technology. Cloning experiments can provide litmus test for the validity of the Jain concept of the existence of soul, the way it is embodied, and the role of *karma* which remains attached to the soul till it is liberated. If a large number of clones are made, most of them are found to be exactly identical (in body characteristics, behavior, life span etc.), with only rare exceptions. How different souls select identical bodies when the determining factors i.e. *āyush karma* and *nām karma* etc. (Chapter-4) of each of them may be different. The role of souls

(*ātmā*) and their associated *karmas* can be verified by designing proper experiments, using modern experimental and analytical techniques of molecular biology.

In the past few decades, tremendous amount of research has been carried out to understand the process of birth. Sexual and asexual reproduction, test-tube babies, surrogate motherhood, cloning, genome and synthetic DNA are some of the examples which show that the complexity of the process of birth has been understood to a great extent. But the biology has not concerned itself much about death except for considering, though wrongly (according to Jainism), that the death is the end of one's life. The oriental religions like Jainism, Buddhism and Hinduism have given much thought to understand the process of death which actually is a prolonged and gradual process and not an instantaneous event as is commonly believed. Death, the inevitability of life, in fact begins with the birth itself and continues till rebirth in the next life. The interval between the two successive deaths, what is termed as life span, is essentially an opportunity for getting rid of one's *karmas* and attaining liberation (*moksha*).

The bodies of all living species, down to the smallest functional unit (cell) are assemblages of many constituents or combination (*skandha*) of several elements and, at the time of death, all these aggregates have to dissociate and regain their "virgin", disaggregated state. It is easy to understand the process of death if we consider the main constituents of the human body according to the anatomy described in Jain and Buddhist scriptures.

The scriptures mention that the body consists of a dynamic network of subtle channels (*nādis*), winds (*prāṇa*) and essences (*bindu*). There are 72000 subtle channels in the body, of which three are the main channels: the spine starting from *mūlādhār chakra* to *sahasrār chakra* and one channel on its either side, i.e. to its right and its left. There are seven main physical *chakras* (*mūlādhār, swādhīsthān, maṇipur, anāhat, vishuddhi, ājñā and sahasrār*), as

described in Chapter-6, and several additional spiritual *chakras*. The two principal side channels, containing impure winds, form knots by coiling up with the central channel of the spine. There are 5 root winds for each of the elements from which the body is made (earth, air, water, space and fire), enabling the body metabolism and 5 branch winds that are responsible for the five senses (touch, taste, smell, vision, and hearing) to function. The essences are located within the channels or in the various *chakras*; the white essence in *sahasrār* and the red in *anāhat chakra*. Our physical body is made up of five *skandhas*, the aggregates, that make the whole mental and physical existence. The faculties of form, feelings, emotions, perception, intellect, consciousness and ego are due to these aggregates. The whole universe is part of our physical existence.

The Jain, Hindu and Buddhist concepts about constituents of physical and mental make up of humans and other living beings, their birth, death, and rebirth are similar in many respects but differ in details. The physical (*audārik*) bodies are made up of five elements (*tattvas*): earth (solid constituents like bones and muscles, hair, nails etc.), water (blood, tears, saliva, urine etc.), fire (energy, organs of vision, warmth), air (*prāṇa*, organs of physical sensation, touch etc.) and space. The mental make up consists of psyche (*mana*), memories (*smṛiti*), emotions, *kashayas* (anger, attachment, greed, ego etc.). According to Jain scriptures, besides the gross physical (*audārik*) body, every one possesses two more body layers: *tejas* (energy) and *karmāṇ* (causal) and, additionally *āhārak* (conscious), and *vaikriya* (multi-shaped) bodies come into existence temporarily whenever required, as discussed in Chapters-2 and 6. Each of these except *ātmā* and *karmāṇ* body dissolves, one by one, sequentially at the time of death. *Ātmā*, accompanied by the *karmāṇ* body, is reborn after death; the sanchit *karma* decides the species in which the *ātmā* takes rebirth. The processes involved in death, thus, are sequential, gradual, prolonged and complex. Death

consists of two main phases: outer dissolution when senses and the sense elements (perception) of the body dissolve, and inner dissolution of the gross and subtle thought states and emotions. Beyond the physical body lies the existence of aura, which extends far into space and is the first to dissolve and with it disappears the perception of the universe. As far as the body is concerned, it is dead when it has lost all its senses e.g. hearing, vision, smell, taste and touch. When a person hears sounds but cannot make out words, hearing consciousness begins to cease. When one sees the outline of an object but not its details, required for recognising it, then the vision consciousness starts to dissolve. With the loss of the faculties of smell, taste and touch, the corresponding sense organs become devoid of their consciousness and effectively the outer universe ceases to exist for the person.

There is a vivid description of the sequence of death, according to Mahāyān Buddhism, in the “Tibetan Book of the Dead” (by Robert Thurman) and the “Tibetan book of Living and Dying” (by Sogyal Rinpoche), which is similar to the Jain concepts. The process of death begins with the sequential dissolution of the five elements making the physical body: earth, water, fire, air and space. Each of them, sequentially withdraws into the next one. First to withdraw is the earth element when the dying person loses strength and cannot support himself, and feels excruciating pain. Cheeks sink or ear lobes curve inward and mind becomes drowsy and delirious with bouts of illusions. When the water element starts withdrawing, the dying person loses control over body fluids and while there is discharge from eyes, nostrils and other organs, tongue, mouth and lips become sticky. At this stage the vision becomes blurred. The next to dissolve is the fire element which turns mouth and nose dry and a steamy heat rises from the crown of the head, palms, soles etc. giving a feeling of being consumed by fire. Breath becomes cold and one cannot eat or drink anything. There is loss of memory

and the dying person cannot even recognize people who are well known to him. The mind, memory and sense of hearing and vision become confused. Thereafter, the air element (*prāṇa*) withdraws into consciousness. It becomes hard to breathe, inhaling becomes short and labored and exhalations become longer. Intellect dissolves and mind gets a feeling of bewilderment. At this stage one is on the verge of falling into coma. At this time, only a sign of warmth remains in the heart. The consciousness rides on wind so that at the time of death, the wind (together with consciousness) leaves the body through any one of the openings of the body. The best is the fontanel, the *Brahma Randhra* located in the crown of the head, which enables one to be reborn as a human, a *yonī* in which attaining enlightenment is possible.

Medically, death occurs when the heart stops pumping and brain becomes dead. This is when the *audārik* (physical) body has disintegrated and the person is declared clinically dead but, at this point of time, the inner death sequence begins and the *tejas* (energy) body begins to dissolve. The *kārmaṇ sharīra* accompanies the soul when it is reborn, till liberation is attained.

According to the scriptures, conception begins when male sperms and female ova unite and our consciousness, driven by *sanchit karmas* is drawn in. During the development of the fetus, the male essence (*shiva* or *purush*), rests in the *sahasrār chakra* and the female essence (*shakti* or *prakṛiti*) rests in *swadhisthān chakra*. During death, the male essence from *sahasrār chakra* descends and female essence from the *swadhisthān chakra* rises, both meeting in the heart and, at this point of time, the mind starts to dissolve. First to dissolve are memories of anger, desire, passions, thoughts and information etc. stored in the mind. Eventually the mind completely ceases to function and only consciousness, in form of an intense light, remains. It is said that at the time of death,

recapitulation of the events of past life occurs and the incidents that have taken place in the whole life flash like a movie film. One can 'witness' every event, good or bad, that has occurred in one's life, in all its vivid details.

Eventually the mind completely ceases to function and the soul finally leaves the body with its *kārmaṇ sharīra*, whereafter one is bound to be reborn and a process, in reverse order of dissolution, is initiated with appearance of *prāṇa* and the soul acquires a mental body. It should be mentioned that this *kārmaṇ sharīra* has the memory and affinity of the previous life, is clairvoyant and keeps hovering over the dead body of the person and its earthly possessions, friends and relatives. Further, it tries to reenter the body and reacquire the material assets to which it was attached. It is said that this state can persist for 3 to 21 days with strong impressions of previous life and the rebirth has to wait for suitable parents when the ensuing life is initiated in accordance with the *kārmic* balances (both good and bad *karmas*) of the previous life. This mental body, not supported by a physical body, is constantly moving about in search of a womb suitable in accordance with its *karma* and, when it finds one, enters it. In this process, the mental body sequentially unites with the fire, water and earth elements. When the soul enters the womb of the prospective mother, a new life begins according to the eternal laws of *karma*.

In case when each, the bad and good *karmas* are completely annihilated, the *karmāṇ sharīra* disappears and the *ātmā* becomes absolutely pure, attains enlightenment and will not be reborn. At this stage the duality of perceiver and the perceived vanishes and *ātmā* attains its true nature of pure *jnān*.

Thus we see that the process of death, involving dissolution of bodily traits (senses, constituents etc.) and mental faculties (anger, passions, ignorance, delusions etc.), is a long and sequential process and becomes complete only with rebirth. These processes occur not only in humans but in all species. The medical or clinical death

occurs when the heart beat, respiration and brain function cease, and is only one of the stages in the prolonged process of death. There is more to death than what the medical science believes in and as a result there is considerable scope of research in this long multi-stage process of death. In this respect, the Jain biology appears to be much more comprehensive in its scope compared to the modern biology. Even so, many aspects of Jain philosophy may appear inconsistent with the modern concepts and have to be substantiated. With the sophisticated tools of molecular biology and genetics now available, it should be possible to verify and reinterpret the scriptures in modern terms and understand their true significance. It is, therefore, desirable to make a synthesis of the two and adopt an integrated approach to understand the complex and intricate processes of birth and death which are of vital importance in understanding life itself.



CHAPTER-11

Jainism and World Peace

Violence is no solution to any problem.

Forgiveness is like fragrance, which a flower gives even while being crushed.

➤ *Jain concept of peace*

➤ *Universal day of forgiveness and friendship*

Peace for all living beings is the credo of Jainism and, therefore, it would only be appropriate to conclude this book with the Jain concept of peace (*shānti*). According to Jainism, peace is an innate quality of soul, essential for attaining *infinite ānanda*, as discussed in Chapter-2. Achieving eternal peace is the ultimate goal of each living being. Peace is an internal aspect of mind as well as an external aspect of the individual, family, society, nation, and indeed the whole humanity. It arises from harmony between the self and everyone around. The internal peace of mind and external peace in the world are apparently two different things, sometimes interdependent and sometimes independent of each other. One can attain internal peace even under the most adverse external situations and vice versa. Some persons may appear outwardly peaceful even though peace within eludes them.

The Jain concept of peace is, in essence, different from peace advocated by some other philosophies. Instead of the principle of “Live and Let live”, wherein one himself has priority or at least as much importance as others, to be able to live in peace, Jains follow

the principle “Let others live” without the narrow selfish considerations of their survival, centred on one’s own self. In Jain philosophy, peace is not merely absence of conflict or unhappiness, but it is something positive to be attained by sacrifices and penances (*tapa*). It is a state of equanimity which is attained by rigorous practices of non-violence (*ahimsā*), self discipline (*sanyam*) and has to be cultivated.

The basic Jain approach to peace is to realize the well-being of all living beings, from plants and tiny insects to giant mammals. Various aspects of peace in Jainism are:

1. The law of interdependence of everyone (*parasparopagraho jivanam*) leads to the concept that well-being of the self depends on the well-being of all others, throughout the universe: “I exist because we exist”. From this follows the principle of non-violence. For this reason, well-being of all living beings constitutes the main thrust of Jain philosophy which is amply reflected in the Jain prayers.
2. Peace entails respecting views of others even if they contradict one’s own views; hence the principle of *Anekāntavād*, as discussed in Chapter- 3.
3. Peace cannot be realized without undergoing sacrifices on the part of the self.
4. Peace or even the well-being of oneself cannot be attained by acquiring material possessions. Hence various practices of observing penance (*tapa*), living frugally, observing *aparigraha* and *asteya* have been advocated in Jainism.

The concept of peace in some other philosophies implies safety and security for oneself over-riding the concern for others. In contrast, Jainism propounds that safety for the self is automatically ensured when everyone else in the world is safe. Hence in Jainism there is an overt emphasis on collective safety and well being of everyone, rather than just one’s own safety.

When one wins over one's own desires and passions, one has achieved internal peace with the self. The external peace, however, cannot be realized merely by conquering others by force. Both Buddhism and Jainism follow the same approach to realize world peace. Intimidating others by powerful weapons does not make one a leader, nor conquering the world makes one a superpower, as is generally, and erroneously, believed. According to Jainism, one can be considered a real leader or a superpower only when others follow you willfully and voluntarily and adopt your values. This can only be achieved by genuinely committing to the ideal of peaceful co-existence which alone can ensure peace and prosperity of all peoples. Only such an approach can ensure security and safety of all nations, big or small, which is a pre-requisite for realizing world peace. A case in point is Buddhism which originated in India but at one stage was being voluntarily followed and practiced by people in more than half the world. The countries where Buddhism flourished include China and Tibet to the north of India, Japan, Malaysia, Thailand and Indonesia to the east, Pakistan and Afghanistan to the west and Srilanka to the south. In oriental thought, this constitutes the real proof of the relevance of a philosophy which was embraced by people of their own free will, without any coercion and is considered to have resulted in a superior status to the people and country of its origin.

Non-violence and forgiveness are two prerequisites for realizing peace. Non-violence is the foremost of all practices and forgiveness, even when one is being subjected to ill-treatment, is the greatest of all virtues. Forgiveness is likened to the fragrance which a flower gives to the hand that crushes it. Non-violence should be practiced in thought, words and deed in a manner that one does not cause hurt to any living being advertently or inadvertently. The true spirit of non-violence implies that if hurt is caused to any one even inadvertently, one should seek forgiveness for the act of omission. Most people in the world long to live in

peace and do not approve of violence. In this respect they inadvertently follow Jain principles. According to the Jain philosophy, violence is not permitted in any of the three modes - thought, speech and action. Even meekly submitting to or condoning an act of violence or abetting it for any reason whatsoever, even when one's own life or personal safety is at stake, is against the Jain values. True non-violence encompasses all the living species and should not be confined only to human beings. Vegetarianism is thus an inherent prerequisite.

There are detailed guidelines for seeking forgiveness. To begin with, one must purify the body, first by fasting and observing other practices of penance (*tapas*), purify the mind by *pratikramaṇa* and meditation as discussed in Chapter-6, and then seek universal forgiveness. It can be done on a daily or yearly basis. The Jains have earmarked a specific day every year, called *samvatsarī*, the universal day for seeking forgiveness. On this day, one aspires to have no enmity with anyone and friendship with all. This day is preceded by 8 to 10 days of penance and meditation, with the aim to purify both the body and mind. Forgiving others is as important as seeking forgiveness for one's own acts. Observing the day of forgiveness and friendship in its true spirit certainly goes a long way in bringing peace and harmony in the family and the society at large. Following the various Jain practices of non violence and forgiveness should usher us into a peaceful world that would ensure well-being and lasting peace for all humanity and further evolution of human race.



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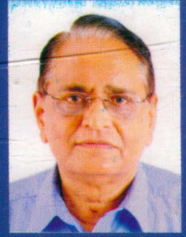
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Professor Narendra Bhandari is a Space scientist. He obtained his Ph.D. in Physics from the Tata Institute of Fundamental Research, Mumbai. He carried out research in Space Sciences at University of California, San Diego, USA and later as Senior Professor at Physical Research Laboratory, Ahmedabad. His research work includes study of moon samples brought by various Apollo missions of NASA and Luna missions of USSR. Prof. Bhandari made pioneering contributions to Chandrayaan-1, India's first Moon mission, by formulating its scientific objectives and identifying suitable instruments for this mission. He contributed in selection of payloads for India's Mars Orbiter mission, Mangalayaan. For his outstanding contributions, Prof. Bhandari was awarded Certificate of Special Recognition by NASA, USA; Outstanding Achievement Award by Indian Space Research Organization; National Mineral Award by Government of India, and Vikram Sarabhai Award in the field of Planetary and Space Sciences. He is a Fellow of the Indian National Science Academy, Indian Academy of Sciences, National Academy of Sciences and Gujarat Science Academy. He was elected President of the International Lunar Exploration Working Group. He has published over 200 research papers as well as edited and published several books, notable amongst them is "The Mysterious Moon and India's Chandrayaan Mission" in English which has been translated in Gujarati, Marathi and Hindi. He has keen interest in scientific foundations of Jain and Buddhist philosophies. The present book gives new insights into Jain path to enlightenment. Its Hindi version Jinatva ka Path has also been published.

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