

Volume : 4
Year : 2017



UGC Approved
An International Referred Research Journal
Wakankar Rock Art and Heritage Welfare Society
Bhopal-Delhi

ICON Journal of Archaeology and Culture



ISSN: 2347-7032

ICON

Journal of Archaeology and Culture



In Honour of
Pranab K. Chattopadhyay

ICON

Journal of Archaeology and Culture

Vol. 4

2017

Editor in Chief

AMIYA CHANDRA

Principal Editor

J.N. PAL

Editor

BRIJESH RAWAT

Senior Associate Editor

JAGPAL SINGH

Associate Editor

**MILISA SRIVASTAVA
SULEKHA BANERJEE**



Wakankar Rock Art and Heritage Welfare Society

Bhopal - 462001

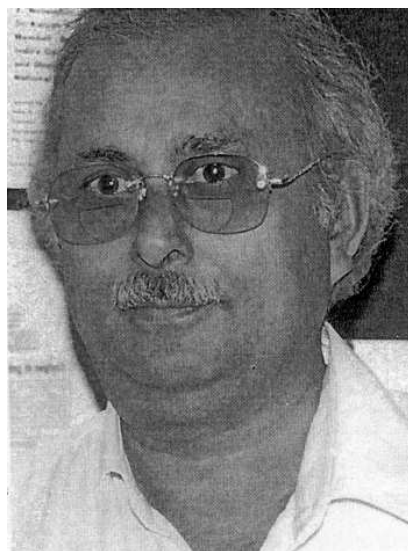
In association with

B.R. Publishing Corporation

Delhi-110 052

In Honour of

DR. PRANAB K. CHATTOPADHYAY



Pranab K. Chattopadhyay

Pranab Kumar Chattopadhyay born in 1945 in Jamshedpur, Jharkhand. His schooling was done at Salkia A.S. High School, Howrah. From the school end he took extra interest in geology, palaeontology and even atomic minerals. His interest in numismatics also developed in school and his interest further developed with repeated interactions in the Indian Museum. In 1962 he was introduced with Kalidas Dutta, the doyen of archaeology of Bengal. Dutta's influence highly motivated his interest to archaeology. His parents demanded him to study engineering in Jadavpur University but because of diversion of interest he was bound to join in a polytechnic and later got the diploma in mechanical engineering from Central Calcutta Polytechnic in 1965.

In 1966 he went to Durgapur where the Alloy Steels Project were being built, he joined as a contractor labour- as a machinist. In 1968 Chattopadhyay got a permanent service in Alloy Steels Plant, in Research and Control Laboratory as an Inspector. He started in depth studying, got a BSc degree and then a graduation in Metallurgy and MA in Ancient History Culture and Archaeology from Rajasthan University. In 1980 he became a Management Trainee which led further to become a Manager in Training Department.

From 1980 onwards he got the support of Prof D.P. Agrawal of Physical Research Laboratory who motivated him to be an Archaeometallurgist. He became the disciple of Prof Basudev Narayan of Patna University and obtained a Ph. D., in Ancient Indian History Culture and Archaeology, with the topic, Archaeometallurgy in India: Studies on Technoculture in Early Copper and Iron Ages in Bihar and West Bengal (1992). His interest in archaeometallurgy includes from tiny coins to massive cannons and now with metallic mirrors.

In 1999 he took voluntary retirement from Alloy Steel Plant. He Studied the Harikela coins in the British Museum, obtain AZ Chand Award, London, October 2000. He joined as a Senior Fellow in the Centre for Archaeological Studies & Training, Eastern India in Kolkata, August 2001 to December 2010.

He fulfilled his parent's desire only after 40 years and was Awarded Ph.D. (Engineering) in Metallurgy in Jadavpur University, in February 2013. The title of the research: *Archaeometallurgical Investigation on Material Technology of High Tin Bronze between the Early Historic and Pre-industrial Periods of Bengal*, under Professor Prasanta Kumar Datta.

He authored three books: -*Archaeometallurgy in India: Studies on Technoculture in Early Copper and Iron Ages in Bihar, Jharkhand and West Bengal*, Patna: K.P. Jayaswal Research Institute. In 2004 also, *Metalcrafts of Eastern India and Bangladesh*, Jaipur: Publication Scheme. With Gautam Sengupta, in 2010, *History of Metals: Eastern India and Bangladesh*. New Delhi: Pentagon Press Ltd. Infinity Foundation has sponsored the project.

His connection with the archaeologist, historians, painters and scholars of Bangladesh is wide. His researches included with the scholars of Jahangirnagar University, Bangladesh National Museum, Asiatic Society of Bangladesh and others.

He jointly edited, *Methodologies of Interpreting Ancient Past of South Asia: Studies of Material Culture*, with Prof. Nupur Dasgupta. This volume was published by the Sharada Publishing House, Delhi, 2016.

He conducted two projects of three years duration with the Indian National Science Academy on the Documentation of Cannons of Eastern India, and the History of High Tin Bronze and Brass of Eastern India. He is much interested in coins, fossils and antiquity collection. He prefers to write jointly with multidiscipline topics. Total papers published in English is 121 in numbers.

Since 1997 he is Visiting Faculty of Archaeometallurgy in the Institute of Archaeology, New Delhi. At present he is doing research on mirrors and Harappan copper technology as revealed from Binjor excavation with Dr Sanjay Manjul. Amongst his friend and well-wishers he remembers Gitika Guha, Dr Sunit Kumar Banerjee, Prof. R. Balasubramaniam, Prof Ashok Kumar Singh, Prof. Murtaja Basseer, Prof Nirmalendu Mukherjee, Enamul Hoque, Thilo Rehren and a few others.

CONTENTS

| | |
|---|-----|
| <i>Pranab K. Chatopadhyaya</i> | v |
| <i>Editorial</i> | xi |
| New Techniques to Discovering Ashtapad Palace Temple <i>Rajmal Jain</i> | 1 |
| V-Shaped Pattern in North-East Indian Art <i>H.N. Dutta</i> | 25 |
| The Ancient Fort of Pakkākot: New Excavations and Researches, 2015-16 <i>Sita Ram Dubey and Santosh Kumar Singh</i> | 31 |
| An Analytical Study of <i>Mahishasurmardini</i> with special reference to Object No. 1588/A24756 of the Indian Museum <i>Sanjib Kumar Singh and Swagata Mukhopadhyay</i> | 41 |
| A Preliminary Notes on the Excavations at Telhara <i>Atul Kumar Verma</i> | 57 |
| Nepalese Art: A Kaleidoscopic View <i>Mala Malla</i> | 61 |
| Jainism in Anantapur District, Andhra Desha, South India <i>P. Chenna Reddy and K. Syamala</i> | 73 |
| Mapping the Landscape of Archaeo-history as a part of a GIS Techniques and GPS Survey Strategy: The Archaeological Heritage of Bangladesh <i>Md. Masood Imran, Sohag Ali, Jesmin Nahar Jhumur and Wasim Ahmed</i> | 83 |
| Yoga in Harappan Civilization <i>J. Manuel</i> | 107 |
| From Miscellaneous Artefacts to Archaeological clues, the Metallic Armament of Mahāsthān <i>Alban François</i> | 111 |

| | |
|--|-----|
| Archaeology of Ancient Cities in Tel River Valley, Odisha Baba Mishra | 121 |
| Buddhism in Ancient Bangladesh Shahnaj Husne Jahan | 141 |
| Progress of Haryana Archaeology in the 21 st Century Vinay Kumar | 147 |
| Protohistoric Settlement of Waina Santosh Kumar Singh | 159 |
| Imagery of North-East India: An Archaeological Perspective Sukanya Sharma | 181 |
| A Study of Spatial and Temporal Context of Second Urbanization in Ganga plain Devendra Kumar Gupta and Dilip Kumar Kushwaha | 193 |
| Representation of Lotus on Terracotta Plaques 4 th to 13 th Century CE Sharmin Rezowana | 199 |
| Various streams of Pedagogic instruction in Ancient India Sima Yadav | 211 |
| Conceptual Development of Cultural Globalism of 21 st Centuries: The Perspective of the Universities of Bangladesh Md. Anisur Rahman | 221 |
| Daṇḍa : The Principle of State Management Shalini Awasthi | 229 |
| New Discovery of <i>Stupa</i> 's relics of <i>Kushana</i> period at Thanesar, Kurukshetra Manoj Kumar | 235 |
| Recent Excavations at Dwarkapur, Sant Ravidas Nagar, Uttar Pradesh Ashok Kumar Singh | 239 |
| Issues and Problems of Late Harappan Culture in North India Vinay Kumar and Gunjan Srivastava | 245 |
| Gleanings on the Inscriptional References to some Minor Buddhist Sects in South-West India Bandana Mukherjee | 251 |

| | |
|---|-----|
| <i>Contents</i> | ix |
| Atisa : As a Great Reformer of Tibetan Buddhism <i>Amita Shukla</i> | 257 |
| Megalithic Ceramic Tradition in Kerala <i>Saravana N. R.</i> | 261 |
| Unpublished Umayyad and Abbasid Silver Coins in the Bangladesh National Museum <i>Shariful Islam</i> | 265 |
| Cultural Interpretations of Land Grants in Gupta Era-Epigraphical Gleaning <i>Vivek Shukla</i> | 291 |
| Indigenous Cutlery Industry at Kanchan Nagar, Burdwan, West Bengal <i>Rangan Kanti Jana</i> | 297 |
| Rock Paintings and their Purpose <i>Rakesh Kumar Sharma and Jagpal Singh</i> | 307 |
| Some Prominent Agricultural Features of Chalcolithic People in Central India <i>Jyoti Bhargava</i> | 311 |
| Display : The Face of The Museum <i>K.K.S. Deori</i> | 317 |
| Culture, Agriculture, Ambedkar and the State of the Vulnerable Group (Scheduled Castes and Scheduled Tribes) in the Contemporary Agrarian Scenario in India <i>Rashi Krishna Sinha</i> | 323 |
| Popular Hindi Cinema Intersecting Tourism <i>Yasharth Manjul and H.S. Jha</i> | 337 |
| BOOK REVIEW : Jain Murtiyon Ka Udbhav aur Vikas <i>Sanjai Kumar Manjul</i> | 343 |
| <i>Plates</i> | 347 |
| <i>Notes for Contributors</i> | 363 |
| <i>Life Members</i> | 365 |
| <i>Editorial Board</i> | |
| <i>Editors</i> | |

EDITORIAL

This issue of the Journal **ICON** is associated with two significant proceedings. Firstly, this Journal has been approved by the University Grants Commission, New Delhi. Secondly this volume has been published in felicitation to honour the renowned Archaeomettalogist Dr. Pranab Kumar Chattopadhyay along with the subject-matter contributed by the invaluable scholars in this issue. Dr. Chattopadhyay has established new dimensions and has done numerous momentous works in the field of Archaeomettalogy. You are an asset to the world of intellectual society. We all have gained equally through his intellectual knowledge. It is because of this reason that you are worthy of this honour.

An effort has been made to publish important matter related to the new excavations carried out in the present journal 'ICON'. Doorway obtained from 'Pakkakot' (Sitaram Dubey and Santosh Kumar Singh), various objects of metals from 'Mahasthan' (Allean Francois), 'Telhara' Excavations (Atul Kumar Verma), Ancient Cities of Tel River Valley (Baba Mishra), Protohistoric Settlement of 'Waina' (Santosh Kumar Singh), Recent excavations at 'Dwarkapur' (Ashok Kumar Singh). Many such archaeological evidences have come to light through the recent excavations that has enriched the Archaeology. Other aspects of Archaeology are also being published in this publication. Evidence of 'Yoga' in Harappan Civilization (J. Manual), the problem of 'Late Harappan Culture' has been beautifully presented (Vinay Kumar and Gunjan Srivastava), Megalithic 'Ceramic Tradition' in Kerala (Sarvana N.R.) and an analysis of consolidating features of 'Agriculture' during Chalcolithic Age in Central India has been discussed (Jyoti Bhargava). The relics of New 'Kushana Stupa' at Thaneshar (Manoj Kumar) and Rocks paintings and their Purpose have also been vividly discussed (Rakesh Kumar Sharma and Jagpal Singh). Second Urbanization in the Ganga Plain has also been verified through evidences (Devendra Kumar Gupta and Dilip Kumar Kushwaha), the matter related to the prevalence of Buddhist religion has been dealt with in 'Buddhism' in Ancient Bangladesh (Shahnaz Husne Jahan) also forms the subject matter of this edition, The Presence of 'Jain religion' in the Anantpur District of Andhra Pradesh (P. Chenna Reddy and K. Syamla), description about the V-shaped pattern in North-East Indian Art (H.N. Dutta), and about the great reformer King 'Atisa' in Tibetan Buddhism (Amita Shukla) has also been dealt with.

Beside this, the use of GIS and GPS Technique has also been outlined (Md. Masood Imran, Sohag Ali, Jesmin Nahur Jhumur and Wasim Ahmed), A new technique has been utilized for the discovery of Ashtapada Palace Temple. The position of Ashtapada Temple has been described (Rajmal Jain). Two distinctive research papers apart from the concerned field has also been place in this issue of the journal namely 'Culture, Agriculture Ambedkar and the State of the Vulnerable Group (Schedule caste and Schedule tribes) in the contemporary Agrarian Scenario in India' in which the agriculture and the farmers have been perceived and the analysis of the situation of Schedule caste and Schedule tribes has also been effectively (or commendably) analysed. The relevance of Ambedkar's view in this context has also been discussed (Rashi Krishna Sinha) and the other one is 'Popular Hindi Cinema Intersecting Tourism' which mentions that cinema and tourism are the product of the culture. Their deep interpersonal relations have also been delineated (Yasharth Manjul and H.S. Jha).

An effort has been made to establish mutual coordination and Harmony and gather matter from all the area of Archaeological genre be it Exploration, Excavation, Epigraphy, Numismatics, Art, Rock-paintings, Pre-history, Proto-history, Chalcolithic and Megalithic cultures.

Though this Journal has already made its recognition with its Volume 2, Year 2015 being felt both nationally and internationally. In the above said issue the research paper of Professor Dilip K. Chakrabarty of Cambridge University U. K. and in the Volume 3 the research paper of eminent scholar of Bangladesh Md. Masood has been published. But this new Volume is very fortunate enough to have the privilege of publishing seven research papers from Nepal, Bangladesh and France of different forms of Archaeology. There is no need comment that this kind of exemplary work was impossible without the incorporation of the indigenous scholars. The cooperation of the writing of intellectual scholars provided momentum to our work and has thus expanded the horizon of the canvas of ICON.

It gives us immense pleasure and happiness in publishing this work. We acknowledge with sincerity and humbleness the work of these distinguished scholars. We believe and anticipate that this journal would make a profound impression in the archaeological and cultural world. A great applause is also due for the excellent publication of this Journal by B.R. Publishing Corporation, Delhi.

AMIYA CHANDRA

New Techniques to Discovering Ashtapad Palace Temple

Rajmal Jain*

According to Jain scriptures, Bhagwan Rishabhdev is the first *Tirthankar* in the present *Aara* who set up a well disciplined civilization. In relevance to this fact he taught the principles of defense, art and agriculture. After establishing his kingdom and teaching the people about civilization, Rishabh Dev became a Monk, did penance at Ashtapad Mountain in Kailash, Tibet area and attained salvation there. His son king Bharat constructed a Temple/ palace with gemstones on shtapad Mountain as a memorial to commemorate the “Nirvana of Rishabh Dev”. The temple was omni directional that is four sided. According to scriptures, this temple was a major Jain Tirth and was described to be situated in the tranquil heights of snow covered Mt. Kailash region. The name Ashtapad is derived from the fact that there are eight (Ashta) Steps (Pad) leading to

the Palace/Temple. The literature further describes that the descendents of Rishabh Dev also made a trench around Ashtapad to protect it. At present, the exact location of Ashtapad is not known.

The scriptures further describes that about 2600 years ago, Gautam Swami, main disciple of Lord Mahavir, climbed, stayed overnight & worshipped at Ashtapad Mountain. If Ashtapad temple existed at that time, then the questions that need to be investigated are what happened to it during the subsequent period? How did it disappear? Could it have been destroyed either by forces of nature or by someone else or was it buried due to geological processes? The current article is an effort to address these questions as well as to explore the new techniques to locate the Ashtapad Temple.

* Physical Research Laboratory, Navrangpura, Ahmedabad; 380 009, India, Email: rajmal@prl.res.in rajmal_9@yahoo.com, rajmalratan@gmail.com

2. Exploring the Period of Bhagwan Rishabhdev: Findings from the Existing Records

a). Jain Scriptures:

In order to achieve the goal of discovering the Ashtapad Palace Temple, first we have to estimate the period of Bhagwan Rishabhdev. In this context, I attempt to fix the milestones to narrow down the period of Aadinath. So, firstly, let us look at the Jain scriptures related to period of Bhagwan Rishabhdev (Khu Chok in Tibetan language), which suggest his period of birth, ruling, meditation and salvation was *koda-kodi* years ago from present. Currently according to Jain scholars, Acharyas, Muni Sadhus and Sadhvi Matajee the unit *koda-kodi* equals $10^7 \times 10^7 (=10^{14})$ years *i. e.* 10^5 times before the birth of the Earth. In Figure 1, a brief overview of period of Bhagwan Rishabhdev described in various Jain scriptures is presented. It may be noted that his

date of birth is given in the scriptures but year of birth has not been mentioned. Further, period of his age, youth, ruling, *Diksha* etc. has been presented in the unit of *Purva* and the height in the unit of *Dhanushya*. However, it appears that both unit *purva* and *dhanushya* were described much earlier, perhaps during the period of Bhagwan Mahavir, and later while using by individuals in last 200-500 years have been interpreted as per their own choice. Even some saints/ scholars have interpreted the unit *purva* as Purv (before). For example they referred the age of the Bhagwan Rishabhdev to be 84 lakh years purv, which, in fact, cannot be interpreted correctly in context to application of two units *viz.* years and *purva*. Thus, in order to estimate the period of Rishabhdev, firstly we have to precisely define and understand the unit *purva* and *dhanushya* etc.

| Period of Bhagwan Rishabhdev (KHYU CHOK) | |
|--|--|
| Jain Scriptures | |
| • | Period from Present: Koda-kodi ($10^7 \times 10^7$ Years) |
| • | Birth: Falgun krishna 8 th ; BUT year is not known ! |
| • | Age: 84 Lacs Purva |
| • | Youth period: 20 Lacs Purva |
| • | Ruling Period: 63 Lacs Purva |
| • | Diksha Period: 1 Lac Purva |
| • | Chagnyasthakaal: 1000 Purva |
| • | Height: 500 Dhanushya |

Fig.1 : Brief summary of birth, period and height of Bhagwan Rishabhdev as described in the Jain scriptures.

Ashtapad Research International Foundation (ARIF) has prepared several Granth volumes, and one of them from Shri Hemchandracharya M.S. (~ 1100AD) as presented in Figure 2 suggests that Bhagwan Rishabhdev had been travelling all over for a period of one lakh years. Though the shlokas (sutras) of this Granth too do not throw any light on

the period of Bhagwan Rishabhdev from present, but to some extent it gives an idea that he lived for at least one lakh years as a monk (*cf.* text in Figure 2). However, the shlokas of this Granth do not refer the unit *purva* and therefore the question of estimating the period of Bhagwan Rishabhdev still remains open.

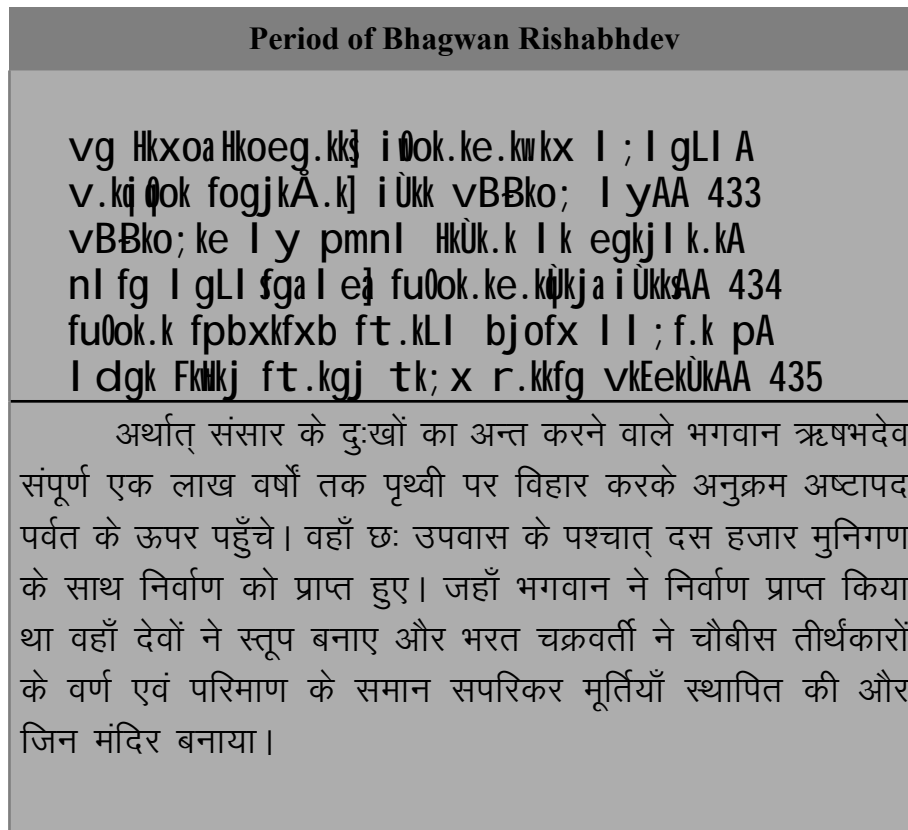


Fig. 2 : Sutras 433-435 from the Granth of Shri Hemchandracharya Maharaj Sahab (~1100AD) suggests that Bhagwan Rishabhdev had been moving over the Earth for a period of 1 lakh years.

In this context we discussed the traditional historic unit *koda-kodi* with many old people, both intellectuals and common folk, including non-Jain and particularly tribal in Gujarat, Rajasthan, Uttar Pradesh and Madhya Pradesh. The outcome of the discussions was almost similar to that was taught to me in a Jain *Paathshala* during my childhood. The units of order of magnitudes in the past (perhaps until 2600 years before present) were defined as follows.

Koda=1000; Kode=100; Kodi=10

In fact we cannot say the above proposed units of magnitudes are very precise and correct, and the people were aware of such numbers because until 650 AD the 'zero' itself was not discovered. As we all are aware that Brahmagupta, around 650AD, was the first to formalize arithmetic operations using the 'zero'. Thus, on the other hand, the possibility of

application of *koda-kodi* to interpret large number cannot be ignored. The number 1000 or more, of course, was very large number few hundred years back. In any case it appears that the unit *koda-kodi* requires be appropriately defining and precisely understanding. Meanwhile we proceed considering the above findings may lead us the path to discovering the Ashtapad. In the twenty-first century the 'zero' is so familiar that to talk about it seems like much ado about nothing. But it is precisely understanding and working with this nothing that has allowed civilization to progress. The development of zero across continents, centuries, and minds has made it one of the greatest accomplishments of human society.

However, we do not have any written old records before *Tirthankar* Mahavir's preaching. The early writing systems of the late 4000–3000

BC were not a sudden invention. Rather, they were a development based on earlier traditions of symbol systems that cannot be classified as writing proper, but have many characteristics strikingly similar to writing. These systems may be described as **proto-writing**. They used ideographic and/or early mnemonic symbols to convey information yet were probably devoid of direct linguistic content. These systems emerged in the early Neolithic period, as early as the 7th millennium BC. Even after the Neolithic, several cultures have gone through a period of using systems of proto-writing as an intermediate stage before the adoption of writing proper. The “**Slavic runes**” (7th/8th century) mentioned by a few medieval authors may have been such a system.

In some states, the *kodi* is referred to be 20, perhaps due to economy inflation about 700 years before present during the period of Mohammad Tuglak (1325-1351 AD). It appears that these units of order of magnitudes had been extensively used by the common folk to represent the orders of period, money, goods *etc.* almost from 650AD. ***Thus considering the above units of orders of magnitude we infer that period of Bhagwan Rishabhdev (koda-kodi) may be between 10 and 20 thousand years from the present.***

On the other hand, it must also be noted that so far we do not have any convincing epic, document, record *etc.*, which evidences that ten thousand years before present the time was measured in hours, minutes and seconds as being done currently. Further back in time to almost several millions of years, in fact, the earth may not be having 24 hours in a day due to periodic nature of its own various motions. Thus, presently, in order to understand the unit *purva* of time we further considered to explore it since period of Bhagwan Mahaveer. Again while discussing with old scholars and senior members of Jain and tribal community we found the following units and sub-units of time.

1 Day=8 *Prahar* (pahar), and 1 *Prahar*=4 *Purva* (also called as Ghadi)

Thus one day has a total 32 *purva* or ghadi. The measurement of *purva*/ ghadi was based on the shadow cast by the standard object due to passage of the Sun or possibly by a Sun-dial system.

The above important investigation enabled us to estimate the various periods of life profile of Bhagwan Rishabhdev as presented in **Table I** and also summarized in Figure 3.

Table I : Biography of Bhagwan Rishabhdev

| | | |
|-----------------|---------------|-------------|
| Age | 84 Lakh Purva | ~719 years |
| Youth period | 20 Lakh Purva | ~171 years |
| Ruling Period | 63 Lakh Purva | ~539 years |
| Diksha Period | 1 Lakh Purva | ~9 years |
| Chagnyasthakaal | 1000 Purva | ~ one month |

| Period of Bhagwan Rishabhdev | |
|--|--|
| Period from Present: Koda-kodiyars (10-20 thousand years) | |
| Magnitude scale: | |
| Koda= 1000 Kode= 100 Kodi= 10 (devaluation madekodi=20) | |
| (MohammadTuglak: 1325-1351 AD) | |
| 1 Day = 8Prahar(pahar); 1Prahar= 4Purva | (Sun dial/ shadow) |
| Age: 84LacsPurva | - ~719 years |
| Youth period: 20LacsPurva | - ~171 years |
| Ruling Period: 63LacsPurva | - ~539 years |
| DikshaPeriod: 1 LacPurva | - ~9 years |
| Chagnyasthakaal: 1000Purva | - ~ one month |
| Biological Scale: | |
| Dhanush:Spinalcord | Dhanushya: cross-section of the vessel $\leq 5\text{mm}$ |
| Height: 500Dhanushya | ~8.3 feet |

Fig. 3 : Brief overview of biography of Bhagwan Rishabhdev in view of re-estimation carried out considering the inputs from the folk regarding the units of time and length.

In addition to the units of orders of magnitudes and time, apparently during the period of Bhagwan Mahaveer (2650 years B. P.), the measurement of large-scale distances and the measurement of small-scale distances as well as structure of the body, perhaps were being presented in cosmological and biological units respectively. For example measurement of structure of the body such as height was being presented in *Dhanushya*. The *Dhanushya* perhaps had been adopted from biological scale because during those times neither FPS, CGS nor MKS unit were existing.

The *Dhanushya* is derived from the biological scale as follows.

Dhanush: Spinalcord, and the *Dhanushya*: cross-section of the vessel of the spinalcord $\leq 5\text{mm}$.

This enables us to estimate the height of Bhagwan Rishabhdev (500 *Dhanushya*) to be ~8.3 feet (8 feet and 4 inch). The mean footprint (charan/ pagala) size of a man of height 5 feet

and 6 inch is estimated to be 9 inch, which upon convolving over the height of Bhagwan Rishabhdev 8 feet and 4 inch may be estimated to be 14 inch. This is in agreement to the footprints recovered/ projected in the Himalaya mountain range for Bhagwan Rishabhdev.

On the contrary, considering the traditional number of the *Dhanushya* often referred by Jain saints and/or Jain scholars as 500 *Dhanush*, which is equal to 3000 feet (1 *Dhanush* = 6 feet), leads the footprint size of more than 400 feet, larger than footprint of Dinosaur, and therefore appears to be unreliable. Otherwise also for a man of 3000 feet height and standing on two legs it is unlikely to balance himself against natural forces exerted by gravity, wind, surface friction, and atmosphere in addition to the excess influence by the solar radiation and greenhouse gases.

The above findings of period of Bhagwan Rishabhdev and his life profile appear to be closely related to the scientific evidences described below.

b). Scientific Aspects

1. Evolution of Himalaya Range

The foremost fact that should be considered in such investigations: Bhagwan Rishabhdev cannot be born before the evolution of the Earth. Thus my first milestone is to fix the evolution of the Earth, Himalaya range and beginning of the monsoon *etc.* I present in Figure 4 the estimated periods, which have been now well-known from various discoveries made by geoscientists, paleoclimatologists and archeologists. The Earth was born sometimes 4.54 billions of years (Ga) before present. Thus birth of Bhagwan Rishabhdev before 4.54 Ga is not likely. Further, the evolution of the Himalaya range took place about 60-55 Ma (million years) before present as a consequence of collision of Asian and Indian plates. It may be noted that the current configuration of the Himalaya range was achieved sometimes 20 Ma years before present. However, the monsoon started only 10 Ma from present time. The brief summary of the Earth's evolution and the birth of the Himalaya range are presented in Figure 4 as **"Fixing the Milestones - I"**. In order to evolve and survival of human life water has a vital role in general and in agriculture in particular. It has been very well established in Jain scriptures that Bhagwan Rishabhdev taught us Aasi (defense), Masi (art) and Krishhi (agriculture). So we may conjecture a first-cut model that period of Bhagwan Rishabhdev might not be before 10 Ma in contrast to generally referred as *koda-kodi*

(10^{14} years) in Jain scriptures. The life of mountain range has been estimated by scientists between 100 - 1000 Ma. Perhaps we might have not forgotten the large altitude peaks of Aravali and Vindhyaachal mountain ranges that existed in the past and decayed over time. Currently they appear as very low altitude mountain series. This allows me on the scientific basis to conclude at this stage the period of Shri Rishabh Dev to be less than 10 million years from now.

2. Human Evolution

The word "*homo*", the name of the biological genus to which humans belongs is Latin for "human". The Latin "*homo*" derives from the Indo-European root, *dhghem*, or "earth".

The first debates about the nature of human evolution arose between Thomas Huxley and Richard Owen. Huxley argued for human evolution from apes by illustrating many of the similarities and differences between humans and apes and did so particularly in his 1863 book

Evidence as to Man's Place in Nature. However, many of Darwin's early supporters (such as Alfred Russel Wallace and Charles Lyell) did not agree that the origin of the **mental capacities and the moral sensibilities** of humans could be explained by natural selection. Darwin applied the theory of **evolution and sexual selection** to humans when he published *The Descent of Man* in 1871.

| Fixing the Milestones - 1 | |
|--|--|
| The Age of the Earth: 4.54 Ga B. P. | |
| Evolution of Himalaya Range: | |
| Collision of Indo-Australian and Asian Plates: 55 Ma B. P. | |
| Current configuration attained: 20-10 Ma B. P. | |
| Monsoon started: ~ 10 Ma B. P. | |
| Life of Mountain Range: 100 - 1000 Ma | |

Fig. 4 : Fixing the geological parameters to estimate the period of Bhagwan Rishabhdev.

A major problem was the lack of fossil intermediaries. It was only in the 1920s that such fossils were discovered in Africa. In 1925, Raymond Dart described *Australopithecus africanus*. The type specimen was the Taung Child, an *Australopithecine* infant discovered in a cave. The child's remains were a remarkably well-preserved tiny skull and an endocranial cast of the individual's brain. Although the brain was small (410 cm³), its shape was rounded, unlike that of chimpanzees and gorillas, and more like a modern human brain. Also, the specimen showed short canine teeth, and the position of the foramen magnum was evidence of bipedal locomotion. All of these traits convinced Dart that the Taung baby was a bipedal human ancestor, a transitional form between apes and humans.

The classification of humans and their relatives has changed considerably over time. The gracile *Australopithecines* are now thought to be ancestors of the genus *Homo*, the group to which modern humans belong. Both *Australopithecines* and *Homo sapiens* are part of the tribe Hominini. Recent data suggests *Australopithecines* were a diverse group and that *Australopithecines africanus* may not be a direct ancestor of modern humans. Reclassification of *Australopithecines* that originally were split into either gracile or robust varieties has put the latter into a family of its own, *Paranthropus*. Taxonomists place humans, *Australopithecines* and related species in the same family as other great apes, in the Hominidae.

Some people commonly assume that our species has evolved very little since prehistoric times. Yet, new studies using genetic information from population around the globe suggest that the pace of human evolution increased with the advent of agriculture and cities. If we are still evolving, what might our species look like in a millennium? Will we survive whatever environmental and social surprises are there for us? Speculation ranges from the hopeful to the dystopian. On the other hand, some people believed in the old science-fiction vision of a big-brained human with a high forehead

and higher intellect (*a concept like Bhagwan Rishabhdev*). Others say humans are no longer evolving physically—that technology has put an end to the brutal logic of natural selection and that evolution is now purely cultural.

However, according to few scientists the big-brain vision has no real scientific basis. The fossil record of skull sizes over the past several thousand generations shows that our days of rapid increase in brain size are long over. Accordingly, most scientists a few years ago would have taken the view that human physical evolution has ceased. But DNA techniques, which probe genomes both present and past, have unleashed a revolution in studying the evolution. Not only has *Homo sapiens* been doing some major genetic reshuffling since our species formed, but the *rate of human evolution* may, if anything, have increased. In common with other organisms, we underwent the most dramatic changes to our body shape when our species first appeared, but we continue to show genetically induced changes to our physiology and perhaps to our behavior as well. Until fairly recently in our history, human races in various parts of the world were becoming more rather than less distinct. Even today the conditions of modern life could be driving changes to genes for certain behavioral traits. My foregoing discussion may lead you to ask many brainstorming questions such as follows and I hope they will not confuse you any further. If giant brains are not in store for us, then what is? Will we become larger or smaller, smarter or dumber? How will the emergence of new diseases and the rise in global temperature shape us? Will a new human species arise one day? Or does the future evolution of humanity lie not within our genes but within our technology, as we augment our brains and bodies with silicon and steel? Are we but the builders of the next dominant intelligence on the earth—the machines?

However, instead of getting confused let us further explore the human evolution to narrow down the birth of Bhagwan Rishabhdev. Tracking human evolution used to be the province solely of

paleontologists, those of us who study fossil bones from the ancient past. The human family, called the Hominidae, goes back at least seven million years to the appearance of a small proto-human called *Sahelanthropus tchadensis*. Since then, our family has had a still disputed, but rather diverse, number of new species in it—as many as nine that we know of and others surely still hidden in the notoriously poor hominid fossil record. Because early human skeletons rarely made it into sedimentary rocks before they were scavenged, this estimate changes from year to year as new discoveries and new interpretations of past bones make their way into print [see “*Once We Were Not Alone*,” by Ian Tattersall; *Scientific American*, January 2000, and “*An Ancestor to Call Our Own*,” by Kate Wong; *Scientific American*, January 2003].

The world’s most famous fossil is of *Lucy*. At the time of her discovery, *Lucy* was the oldest known and best preserved early human ancestor (Johanson and Edey, 1984). In Figure 5, in order to fixing the next milestone, you may view the real fossilized remains of *Lucy*. However, there is evidence of the famed fossil *Ida* (an animal of Lizard type) who at 47 million-years-old is

unbelievably well-preserved and provides a view into our primate past.

Nevertheless, the exploration of 6 million years of human evolution and the investigation of the 1974 unearthing of *Lucy* shook the scientific community and altered our understanding of human origins. The examination of the stunning 78 foot mural that depicts 6 million years of human evolution, over 100 cultural artifacts from Ethiopia, and *Lucy*’s homeland suggest why Ethiopia is called the *Cradle of Mankind*.

However, the fossil record tells us that the oldest member of our own species lived 195,000 years ago in what is now Ethiopia. From there it spread out across the globe. By 10,000 years ago modern humans had successfully colonized each of the continents save Antarctica, and adaptations to these many locales (among other evolutionary forces) led to what we loosely call races. Groups living in different places evidently retained just enough connections with one another to avoid evolving into separate species. With the globe fairly well covered, one might expect that the time for evolving was pretty much finished.


| Fixing the Milestones - 2 | |
|---|---|
| <p>• Human Evolution: Few million years</p> |  |
| <p>The discovery of <i>Lucy</i> brought back to 3.2 million years the human presence on earth. She was found in Ethiopia in November 1974</p> | |
| <p>Face to face with <i>Lucy</i>, the world’s most famous fossil. At the time of her discovery, <i>Lucy</i> was the oldest known and best preserved early human ancestor. Height ~1.1 meter</p> | |
| <p>Recent investigation shows that brain size is positively associated with intelligence in man and that this is the major reason for the increase in brain size of the hominids during the last 3 – 5 million years.</p> | |

Fig.5 : The real fossilized remains of *Lucy* (right). On left brief summary of Human evolution along with structure details of *Lucy* and the reason of increase in brain size are presented.

Nevertheless, the recent investigations reveal that the brain size of hominids has increased approximately threefold during the evolution of the hominids from *Australopithecus* to *Homo sapiens*. It is proposed that the principal reason for this increase is that larger brains conferred greater intelligence, and greater intelligence conferred a selection advantage. A number of anthropologists have difficulty accepting this thesis because they believe that brain size is not associated with intelligence in man. Evidence is reviewed, and new evidence from two studies further confirms that brain size as measured by head size is positively correlated with intelligence as measured by intelligence tests. It is considered that brain size is positively associated with intelligence in man and that this is the major reason for the increase in brain size of the hominids during the last 3.2 million years. ***Considering the trend of increasing brain size and intellect continuing over time we may address the question how during the period of Bhagwan Rishabhdev the man evolved with larger forehead (brain size) and the intellect sometimes around 10-20 thousand years before present.***

Thus based on human evolution and brain size versus intellect I may further narrow down the ***birth period of Bhagwan Rishabhdev between 3.2 Ma and 10000 years from now.*** I would also like to briefly mention again that forehead and physical structure of Bhagwan Rishabhdev described in previous section under Jain scriptures is also significantly larger and similar to what scientific evidences reveal.

3. Forces Influencing Earth's Climate

As shown in Figure 6, the climatic cycle over the Earth is governed mainly by five major forces viz. (1) Earth, (2) Geodynamics of Earth's Inner Core and Mantle, (3) Solar, (4) Cosmic Ray and (5) Greenhouse gases. The Earth Force reveals: a). 41 kyr axial tilt cycle, b). 100 kyr eccentricity cycle, c). 100 kyr equatorial plane oscillation with

respect to the ecliptic, and d). 23 kyr cycle of the precession of the equinoxes. Among all five forces the Earth's force is the strongest and has influenced the earth's geology, geophysics and environment, and hence the climate periodically, which affected the human civilization, and perhaps almost all life culture with low to high magnitudes at periodicities of the motion.

| Climate Cycle | |
|--|--|
| Major Climate Drivers | |
| Earth Forcing: | |
| a) | 41 kyr axial tilt cycle |
| b) | 100 kyr eccentricity cycle |
| c) | 23 kyr cycle of the precession of the equinoxes |
| Geodynamics of Earth's Inner Core and Mantle: | |
| a) | super-rotation and inner-core nutation |
| b) | super-plumes |
| c) | Subducting d). plates volcanoes |
| Solar Forcing: | |
| a) | 11 yr solar cycle |
| b) | other solar cycles |
| Cosmic Ray Forcing: | |
| a) | Related to heliosphere and magnetosphere shielding |
| b) | Only the high energy cosmic rays play a role |
| Greenhouse gases: | |
| a) | CO ₂ |
| b) | Methane |
| c) | Water vapor |

Fig. 6: Major drivers of climate change over the Earth.

Shown in Figure 7, the next milestone fixing, are the fluctuating sequences of glacial and Inter-glacial during the last five million years revealed from the sediment records.

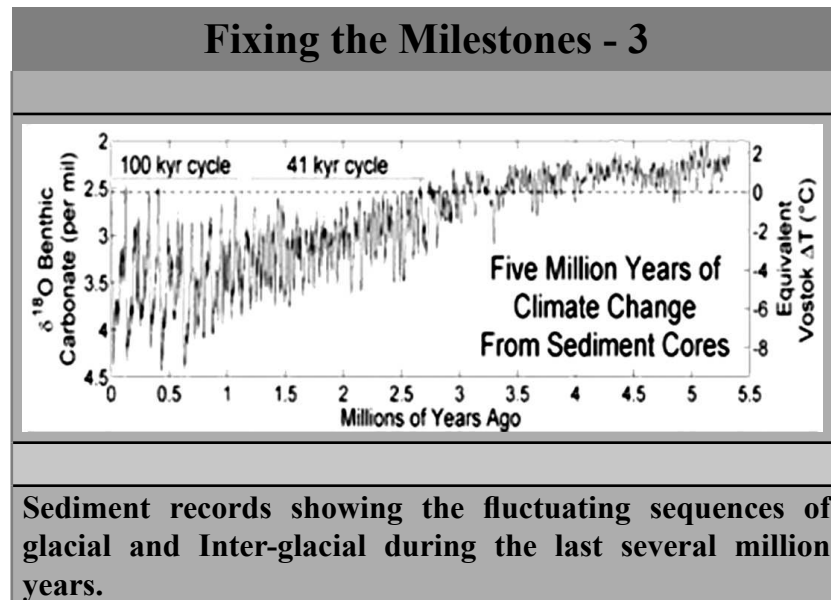


Fig. 7 : Five million years of climatic change from sediment core. The O^{16} treatment on the Vostok ice core reveals Benthic Carbonate (left y-axis) and equivalent global air temperature (right y-axis) variations over the Earth.

The O^{18} treatment over Vostok Ice core sediment when observed in high time resolution then it revealed unambiguously the period of 100 thousand years of catastrophe on the Earth in terms of last glacier maximum (LGM). I present in Figure 8 the time series of about 425 thousand years. The mean global air temperature (15°C) referred as 0 on the y-axis reaches to about -8°C on an average every 100 thousand years. Similarly, on the same time scale of 100 thousand years the mean temperature rises up to 3°C , which misleadingly has been interpreted as global warming by some of the climate scientists. Thus, in fact between LGM and warm phase time difference is about 50 thousand years. The last LGM occurred about 22 thousand years before present. Recent investigations of quaternary glaciation of Muztag Ata and Kongur Shan region have produced the evidence for glacier response to rapid climate changes throughout the Late Glacial

and Holocene in westernmost Tibet (Seong *et al.*, 2009). Under the severe cold and arid conditions of the LGM, vegetation seriously degraded and forest retreated to the south and east margin of the Tibetan Plateau (Tang *et al.*, 1998). According to Yafeng Shi (2002) glaciers fed by monsoonal precipitation are mainly located on the Tibetan Plateau and easternmost Asia. These are characterized by simultaneous accumulation and ablation in summer season. The southeast part of the Tibetan Plateau experiences monsoonal precipitation in excess of 1000 mm/yr resulting in maritime temperate glaciers. In contrast, precipitation in the middle and northwest part of the Tibet Plateau decreases from 1000 to 200 mm/yr, resulting in the formation of continental cold glaciers.

During the last glacial, the regions of heavy monsoonal precipitation were restricted to the southeast corner of the Plateau. The westerly

weak precipitation zone shifted southward, and occupied the major northwest part of the Plateau, where the extreme continental type glaciers greatly expanded. In the eastern margin of Asia including Taiwan, Central Japan, Hokkaido and probably Mount Changbai, maritime type glaciers were more extensive because of higher monsoonal precipitation, especially heavy snowfall in northwest Japan owing to the rich moisture content of the winter monsoon over the Japan Sea. The millennial scale monsoon intensity and glacial cycle in the Tibetan Plateau are strongly affected by the precession cycle and the orbit-inclination cycle which dominates the solar irradiance variation in low latitudes, as the high radiation and strong monsoon caused the warmer and wetter climate during 40–30 thousand years before present. The low radiation produced a weak monsoon and large depression of temperature and precipitation around 21 thousand years before today. This climatic pattern differs from that in the high latitudes where the eccentricity cycle is prominent. The temperature during the last glacial maximum (LGM) was 6–9⁰ C lower than today on the Tibetan Plateau and the equilibrium line altitude was depressed by about 1000m in the southeast part, and in the east, south and west margins of the Plateau where precipitation was high. The equilibrium line depression was 500–300m in the inner and especially the west part of the Plateau. This variation in equilibrium lines might be caused by the combined effect of the decrease in precipitation, the expansion of extreme continental glaciers and the active uplift of glaciated mountains. The estimation of a glaciated area of about 350,000 km² in the Tibetan Plateau and roughly 500,000 km² in High Asia based on observations of prominent features of LGM glacier extension, may be the direct evidence that shows there was no Quaternary unified ice sheet developed in the Tibetan Plateau.

The actual extent of the glaciated area during LGM in the Tibetan Plateau was calculated from the Quaternary glacial distribution map of Qinghai–Xizang (Tibet) Plateau at a scale of 1:3,000,000 (Li et al., 1991) considering that this small-scale map cannot exclude mid-latitude westerlies.

However, shortly after 19 ka BP, drought was exacerbated, pollen content decreased and was dominated by Chenopodiaceae, and the lake water turned brackish. Around 17 ka BP the lake shrank and separated into some small lakes, resembling the present state (Li, 1998). Under the severe cold and arid conditions of the LGM, vegetation seriously degraded and forest retreated to the south and east margin of the Tibetan Plateau (Tang et al., 1998). In summary, five shorter cold and warm stadial and inter-stadial cycles occurred during the last glacial and interglacial cycle in the low-latitude regions, due to the tremendous influence of precessional and obliquity variables. According to the Guliya ice core records and the data from lacustrine deposits and pollen records from the major part of the Tibetan Plateau, the summer monsoon was stronger, air temperature was higher and precipitation was abundant in the interstadial times. The winter monsoon was stronger, air temperature was low and precipitation was less in the past glacial stadials.

Thus current human civilization appears to be of less than 22 thousand years from ***present if we consider similar catastrophe occurred during last LGM.*** The greenhouse gas (CO₂) emission (green color in Figure 8) also reveals similar results. The records also reveal that the period from 850 to 630 Million year B. P. was most severe Ice Age in the Earth's history. The greenhouse gas CO₂ emission is a consequence of large volcano eruptions after the LGM.

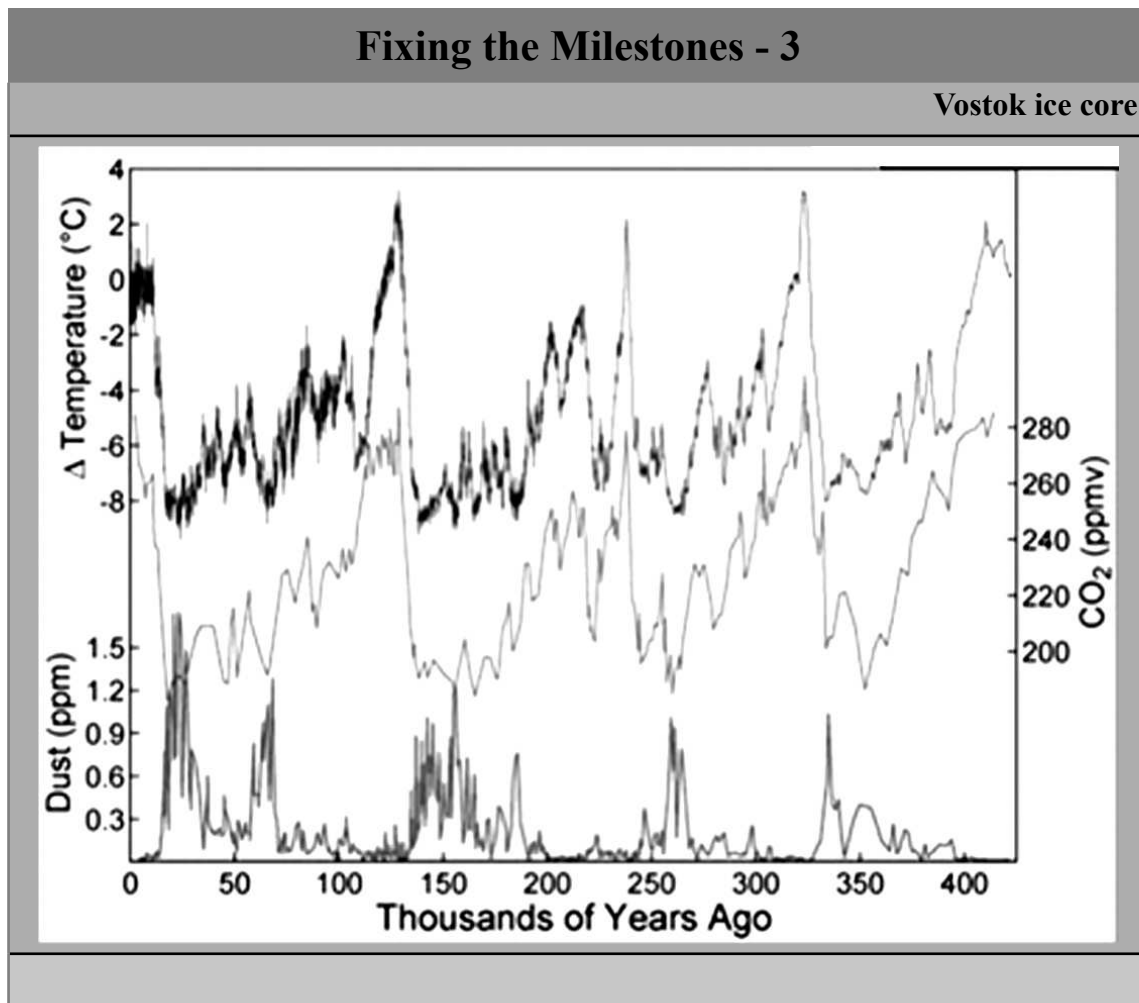


Fig. 8 : Climate change over the Earth in Four hundred fifty thousand years from present. The O^{16} treatment on the Vostok ice core reveals CO_2 greenhouse gas emission, (right y-axis) and equivalent global air temperature (left y-axis) variations over the Earth. The increase in CO_2 emission and hence enhancement in global air temperature is the consequence of volcano eruptions that often take place during long lasting glaciers.

On the other hand Geodynamics of Earth's Inner Core and Mantle forcing generates: a). super-rotation and inner-core mutation, b). super-plumes, c). Sub-ducting and d). plates and volcanoes. In view of this force the Earth has been observing significant variation in its super-rotation and mutation in last few millions of years, which results in several earthquakes and volcanoes in addition to wide climatic changes. One of the major forces affecting the Earth's climate in a variety of ways is the Solar Force, which has been

well studied. Recent studies carried out at Physical Research Laboratory and over the globe show that the Sun is a major force to drive Space Weather and Space Climate, the two new emerging areas of research. The most striking and remarkable property of the Sun is the differential rotation, which along with its convection property produce sunspots. These sunspots have 11-year periodicity and are the major form of solar activity. The 80-year and 200-year periodicity of the solar activity is related to climate change over the Earth (Bhatt,

Jain, Aggarwal, 2009). The 11-year, 80-year and 200-year periodicities may be well noted in Figure 8 as small fluctuations in long period time series. Nevertheless, in Figure 9 the sunspot cycle variation since 1700AD to present is shown along with predictions for the future sunspot maximum year and amplitude. However, it must be noted that sunspot activity periods may affect the climate cycle to significant extent but not to the extent of catastrophe on the Earth.

Solar Forcing

The 80 and 200-year sunspot cycle are also Climate cycle: The Wolf-Gleisberg cycle of ~80 years influence the earth by stimulating solar forcing so as to vary the global air and ocean temperatures. The 80-year periodicity cycle is marked in a wide range of terrestrial evidence since millions of years and is still at work. It is found that climatic fluctuations are induced at the turning points of such cycles.

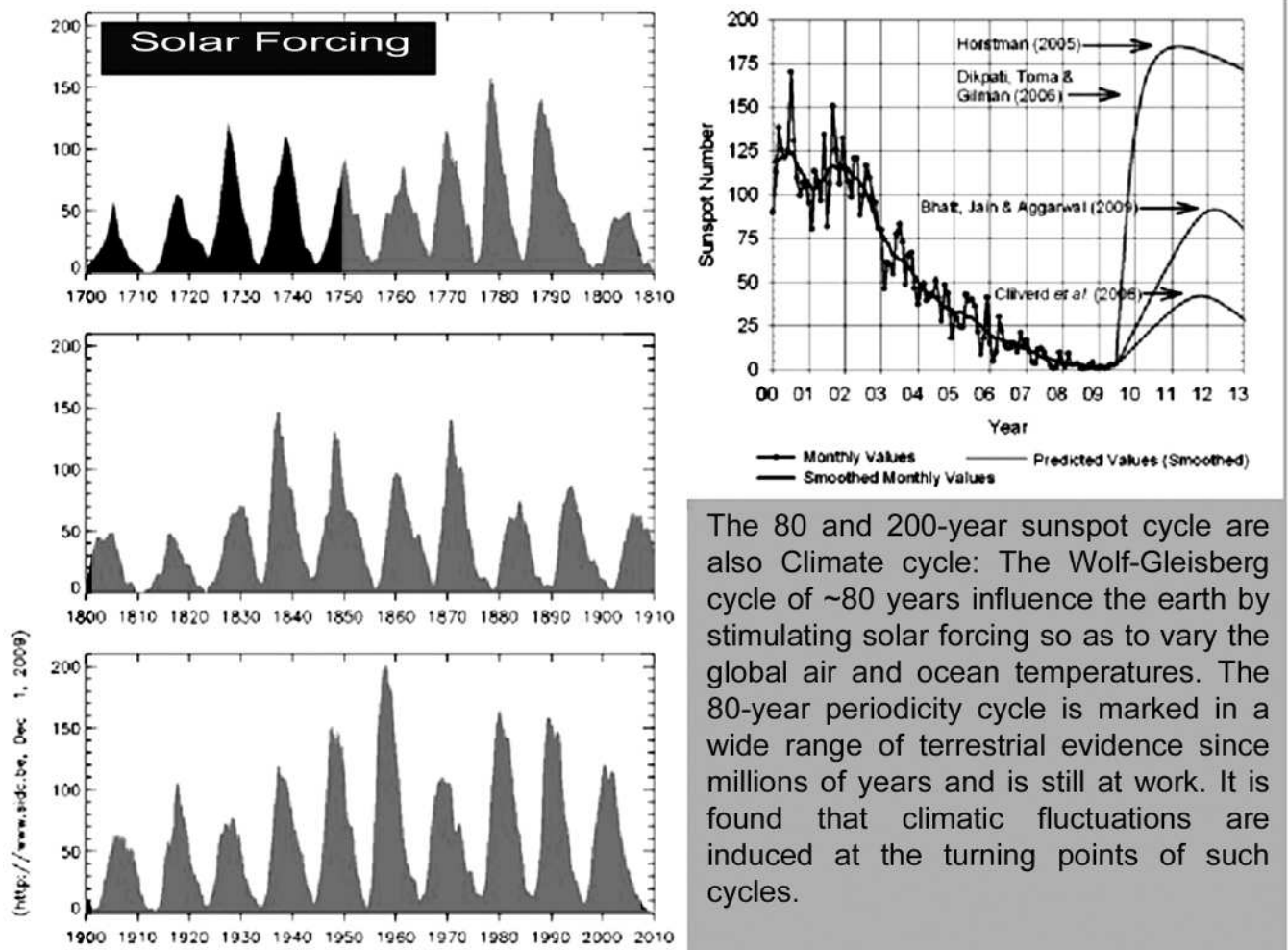


Fig. 9 : The sunspot cycle variation since 1700AD to present (left-side). On the top right-side predictions for the future sunspot maximum year and amplitude are presented. Bottom right-side briefs the relationship between the sunspot activity and the climate cycle on the Earth.

The other climate affecting forces are the Cosmic Ray Forcing, which is related to heliosphere and magnetosphere shielding; however, only the high energy cosmic rays play a role, and the Greenhouse gases: a) CO₂, b) Methane, c) Water vapor, and d) TPW (true-polar-wander).

Throughout history, the changing fortunes of human societies in Asia have been linked to variations in the precipitation resulting from seasonal monsoons. The variations in monsoon climate over longer time scales also influenced the evolution of the world's highest mountain chain, the Himalaya. The climate over much of Asia is dominated by seasonal winds that carry moist air over the Pacific Ocean into East Asia and over the Indian Ocean into South Asia. The East and South Asian monsoons are responsible for most of the rainfall in these regions. Although the time when these monsoon patterns were first established is unknown, many lines of evidence suggest that they first came about at least 24 Ma. While it makes sense intuitively that heavy rainfall should be correlated with more aggressive erosion, it is important to see such direct evidence of the coupling between the processes that define the evolution of mountain ranges and climatic processes. It implies, once again, that Earth is a complex system, and we cannot begin to fully understand mountain building without appreciating the roles of the hydrosphere and atmosphere in the evolution of mountain ranges.

For ninety percent of the last million years, the normal state of the Earth's climate has been an ice age. Ice ages last about 100,000 years, and are punctuated by short periods of warm climate, or inter-glacials (*cf.* Figure 7 and 8). The last ice age started about 114,000 years ago. It began instantaneously. For a hundred-thousand years, temperatures fell and sheets of ice of more than kilometer thick grew to envelop much of North America, Europe and Asia. The ice age ended nearly

as abruptly as it began. ***Between about 12,000 and 10,000 years ago, the temperature in Greenland rose more than 10 °C.*** The climate of the ice ages is documented in the ice layers of Greenland and Antarctica. The ice-core of these layers has been extracted, and studied in the laboratory. Not only were ice ages colder than today, but the climates were considerably more variable. Compared to the norm of the last million years, our current climate is remarkably warm, stable and benign. The cold temperatures are detrimental for human welfare and warm temperatures are beneficial. From about 1500 to 1800 AD, the climate cooled slightly during a period known as the Little Ice Age. The oscillation between ice ages and interglacial periods is the dominant feature of Earth's climate for the last million years. Earth's climate is controlled by the Sun. In comparison, every other factor is trivial. The coldest part of the Little Ice Age during the latter half of the seventeenth century was marked by the nearly complete absence of sunspots.

We, therefore, in the context to climate variation over the Earth in the last few millions of years to very recent past, may narrow down the birth period of Bhagwan Rishabhdev to be between 12 and 10 thousand years from present, which is in close agreement to one koda-kodi period mentioned in Jain scriptures, however in view of my derivations described in earlier section.

3. Ashtapad Temple/ Palace

a). Mount Kailash

Mt. Kailash is amazingly symmetrical striated pyramid at 7000 meters height. At about 36 kilometer to the south of Mt. Kailash lies Lake Mansarovar. Four great rivers of Southeast Asia emanate from this lake. They are Sindhu, Brahmaputra, Sutlej and Karnali. Shown in the Figure 10 is the satellite picture of Mount Kailash region and possible mountain site of the Ashtapad.

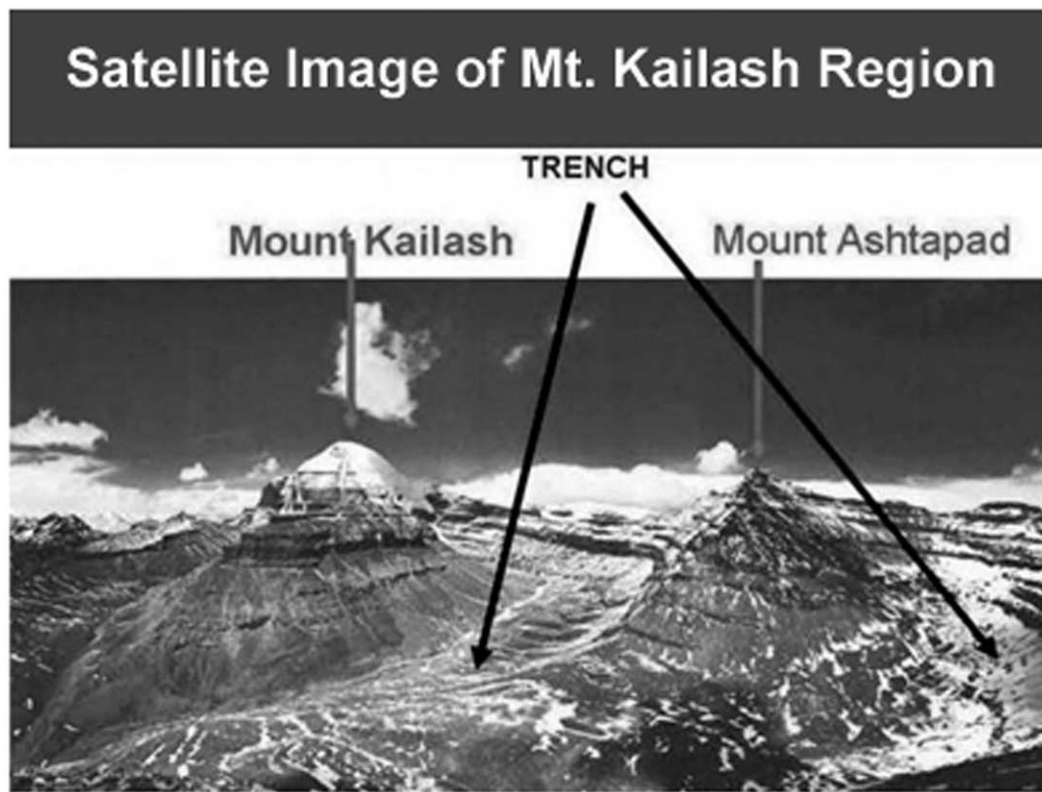


Fig. 10: Satellite image of Mount Kailash region and possible mountain site of the Ashtapad.

In the area of western Tibet and around Himalayan border land, original indigenous religion (spiritual & cultural tradition) was called BON PO which is supposed to be approximately 8000 years old or more and was contemporary with the Jain religion at that time. The MOINBA people numbering around 100 thousand practiced BON PO religion. Many of the principles of the BON PO are similar to Jain principles. BON PO has specialized Shaman priests and Jain religion leaders were also called Shraman.

The BON PO has influenced the religious and cultural developments of numerous people in Central Asia. Until about 7th to 8th century BON PO was a predominant religious culture, over the extremely wide area of Central Asia. It represents the indigenous source of Tibetan culture.

Records of early history of Tibet and Han dynasty and the relationship between SHANG

people and JIANS are interesting to note. Around 1400 BC there was a Semi Tibetan people called “JIAN” mixed with SHANG people. Tibetan people may be the descendent of “JIAN” also called JIAN Tibetan people. JIAN may be a synonym of JIN (Tirthankar), which means conqueror.

b). Geological Changes in the Himalaya Range

In order to locate the Ashtapad Mountain we must consider the geological changes occurred in the Himalaya range in last few thousand years from present. The great Himalaya mountain range formed as a result of collision of the Indian and Asian plates due to tectonic forces driving them towards each other about 60 millions years (Ma) before present. The maximum elevation of a newly built topography primarily depends upon the equilibrium between the driving (compressive) and resisting (gravitational) force. However, the height of the topography also increases with the

viscosity or the horizontal convergence. Further, the maximum topographic elevation is controlled by lithospheric rheology and thermal state. The high content in radiogenic nuclides in the crust leads to topographic upper limit. In Figure 11, therefore, I attempt to address the question what sets up the maximum elevation of a topography? It may be noted that the maximum strength of the topography depends on frictional forces versus viscosity in the continental lithosphere. Based on current topography (Altiplano, Tibet), it may be assumed that for present time the maximum sustainable elevation is around 5 km (Lave and Avouac, 2000).

Lave and Avouac (2001) also investigated the pattern of fluvial (river related) incision across the Himalayas of central Nepal, which they estimated from the distribution of Holocene and Pleistocene terraces and from the geometry of modern channels along major rivers draining across the range. The terraces provide good constraints on incision rates across the Himalayan frontal folds (Sub-Himalaya or Siwaliks Hills) where rivers are forced to cut down into rising anticlines and have abandoned numerous strath terraces. Farther north and upstream, in the Lesser Himalaya, prominent fill terraces were deposited, probably during the late Pleistocene, and were subsequently incised. ***The amount of bedrock incision beneath the fill deposits is generally*** small, suggesting a slow rate of fluvial incision in the Lesser Himalaya. On the contrary, the terrace record is lost in the high range where the rivers are cutting steep gorges, which, in fact, is very important in understanding and estimating the steps formation of Ashtapad Mountain.

However, to complement the terrace study, fluvial incision was also estimated by few investigators from the modern channel geometries using an estimate of the shear stress exerted by the flowing water at the bottom of the channel as a proxy for river incision rate. This approach allows

quantification of the effect of variations in channel slope, width, and discharge on the incision rate of a river; the determination of incision rates requires an additional lithological calibration. Recent results reveal that the two approaches show yield consistent when applied to the same reach or if incision profiles along nearby parallel reaches are compared. In the Sub-Himalaya, river incision is rapid, with values up to 10–15 mm/yr. ***It does not exceed a few millimeters per year—in the Lesser Himalaya, and rises abruptly at the front of the high range to reach values of 4–8 mm/yr within a 50-km-wide zone that coincides with the position of the highest Himalayan peaks, perhaps Mount Kailas and Mount Ashtapad.*** Sediment yield derived from the measurement of suspended load in Himalayan river/s suggests that fluvial incision drives hill-slope denudation of the landscape at the scale of the whole range. The observed pattern of erosion is found to closely mimic uplift as predicted considering into account erosion and slip along the flat-ramp-flat geometry of the Main Himalayan Thrust fault (*cf.* Figure 11). The morphology of the range reflects a dynamic equilibrium between present-day tectonics and surface processes. The sharp relief together with the high uplift rates in the Higher Himalaya reflects thrusting over the mid-crustal ramp rather than an isostatic response to re-incision of the Tibetan Plateau driven by late Cenozoic climate change, or late Miocene reactivation of the Main Central Thrust.

Carretier et al., (2009) explored the extent to which it is possible to convert erosion rate data into uplift rate or erosion laws, using a landscape evolution model. Transient stages of topography and erosion rates of a block uplifting at a constant rate are investigated at different spatial scales, for a constant climate, and for various erosion laws and initial topographies. They identified three main model types for the evolution of the mountain-scale mean erosion rate. Observations of a mountain in the Gobi-Altay range in Mongolia support the

exponential-type model. This suggests that the erosion of this mountain is either detachment-limited or transport-limited with a significant transport threshold. This study shows that drainage growth could explain differences in erosion rate measurements on different spatial scales in a catchment.

What sets up the maximum elevation of a topography?

Equilibrium between driving and resisting forces described by Argandnumber.

$$Ar = \frac{\text{Gravitational forces}}{\text{Compressive forces}} = \frac{\int_h \rho g h dh}{\int_h \sigma_{xx}(h) dh}$$

However, the height of the topography will also increase with the viscosity or the horizontal convergence.

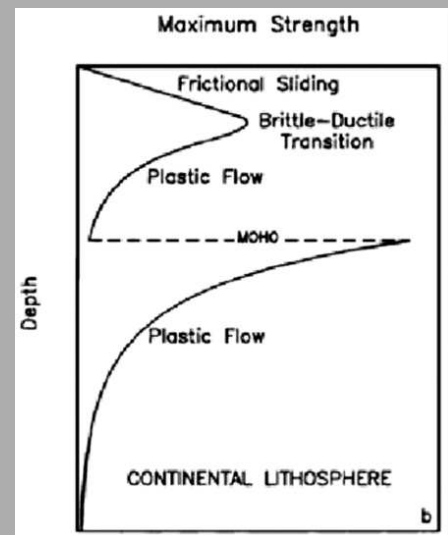


Fig. 11 : Illustration of dependence of elevation of newly built mountains. Left - the maximum elevation of a newly built topography primarily depends upon the equilibrium between the driving (compressive) and resisting (gravitational) force. It also increases with the viscosity or the horizontal convergence. Right - the maximum strength of the topography depends upon frictional forces versus viscosity in the continental lithosphere.

Shown in Figure 12 is the processed image of the world where the high altitudes on the Earth are presented by dark red color. The strongest dark red color may be noted above north-east part of India, where Himalaya mountain range is located with an altitude of more than 4 km. The Himalaya range is remote from human interference and therefore negligible pollution may be seen in terms of emissions, effluents and electromagnetic

radiation, which do not permit the light pollution as may be noted from Figure 13. It is above 40% of atmosphere and 90% of water vapor and aerosols (Beek et al., 2009). This makes the Himalaya range suitable for the study of various science disciplines including geology and astronomy (Prabhu and Anupama, 2010).

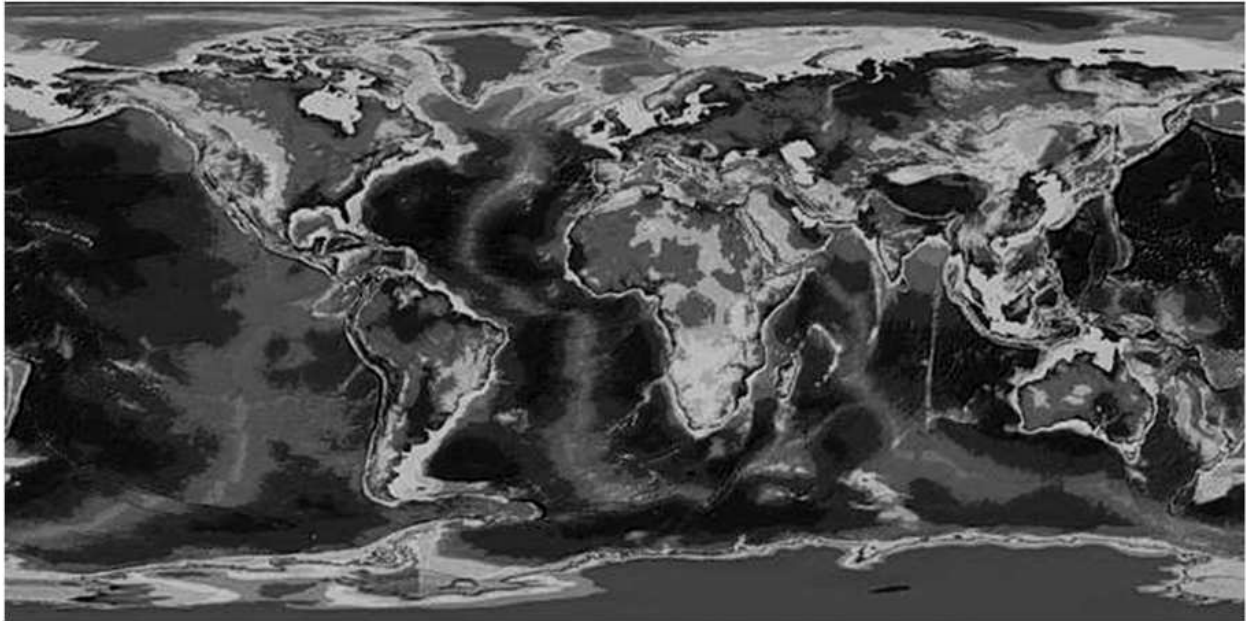


Fig. 12 : The processed image of the world where the high altitudes on the Earth are presented by dark red color. The strongest dark red color may be noted above north-east part of India where Himalaya range is located with an altitude of more than 4 km.

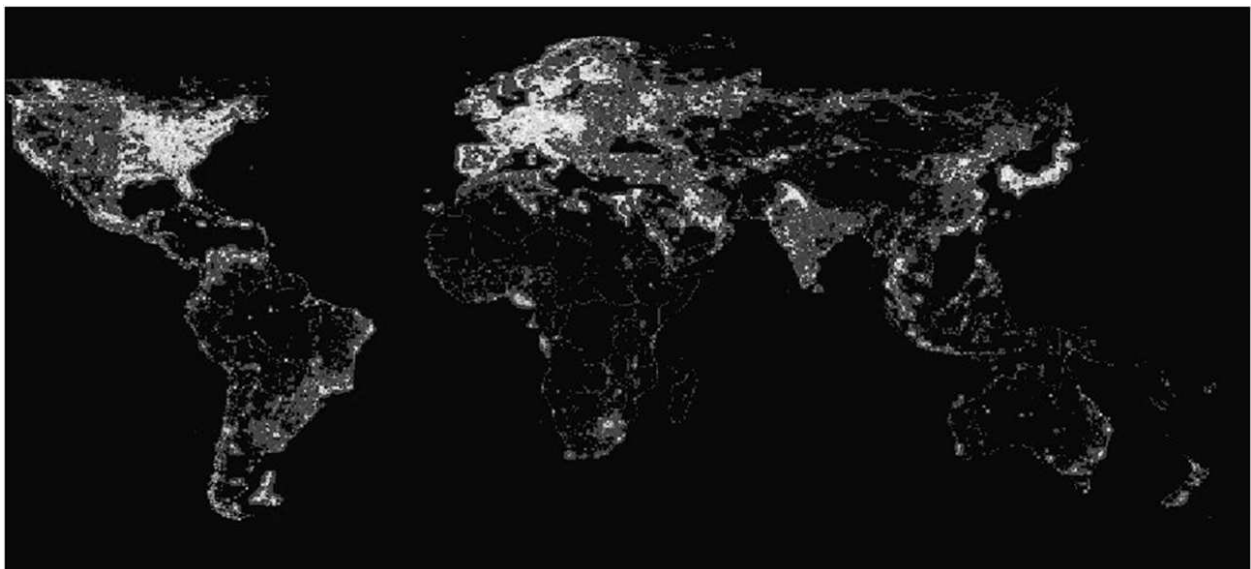


Fig. 13 : Light pollution map of the Earth. It may be noted that the Himalayan range is almost unpolluted.

Thus, now, in order to address the question of location and existence of the Ashtapad Temple, firstly we consider its period between 20 and 10 thousand years from present. In view that the Ashtapad Temple is currently not visible we may conjecture: (a) the temple got destructed due to heavy deposition of the ice sheets and/ or due to

landscape, volcanoes, earthquakes *etc.*, and later during denudation the bits and pieces either spread over the mountain and nearby lakes or the temple penetrated/pervaded/buried into the mountain as a consequence of tectonics forces and further sunk due to gravity forces; (b) the temple was attacked and destructed by human forces. Nevertheless,

both models (a) and (b) should have left remnants/ ruins/ artifacts in the sub-surface to over the surface level, which, however, have not been found so far, neither by the scientists engaged in the geological/ archaeological/ anthropological research nor by the teams of ARIF who conducted recently three campaigns between 2006-2009. Nevertheless, recent investigations suggest that denudation rate is approximately 0.5 mm/year (Lavé and Avouac, 2001) to 5-10 mm/yr (Enkelmann et al., 2011), which restricts the increasing uplift due to various natural forces such as volcanoes, landscapes, pressure of ice sheets and earthquakes *etc.* In last several thousand years the Himalayan mountains have experienced almost all such natural and geological forces including severe climate changes, which, most likely, also might have affected the structure of the Ashtapad Temple. We may conclude in context to model (a) that due to denudation caused as a consequence of erosion and relief *etc.*, described earlier, the temple's ruins/ artifacts flowed down forming the sediments and/ or buried into the sub-surface of the mountains or into the lakes. If the temple as a whole or ruins were buried in the Ashtapad Mountain about 10 thousand years before present then the ruins or artifacts might be at a depth between 5 and 50 meters. The possibility of model conjecture (b) also exists but the destruction by enemies or invaders is likely in less than one thousand years before present in view of description of existence of the Ashtapad temple in the Granth of Shri Hemchandracharya M. S. (~1100 AD). Next, even in this case also the ruins must be visible, which are not evident since last few hundreds of years. On the other hand, the history evidence that the Himalaya mountain range has experienced several climate changes in last several thousands to millions of years. During these climate changes in addition to denudation or pressure by the ice sheets the mountains have experienced several volcanoes, landscapes and earthquakes, which might have destroyed the Ashtapad temple/ palace, and the ruins/ artifacts penetrated/ pervaded into the mountain.

Such incidence, however allows the material to flow down instantaneously (few minutes to several hours) and the speed will be governed by pressure of the earthquake shock, gravity, friction forces exerted by the mountain inner surface, and thermal unbalance if volcano is the cause. We may estimate the depth of temple ruins as a function of the magnitude of these parameters and assuming that the ruins have not further penetrated significantly over the period of 10-20 thousand years. The simple estimate suggests that ruins may not exceed the depth of 50 meters. Probing to this depth or to larger extent caused by denudation is possible and we propose the application of radio waveband technique for this challenge in the next section. However, in view of description of the existence of the Ashtapad Temple in the Granth of Shri Hemchandracharya M. S. (~1100 AD), I would particularly like to mention very recent severe climate change during 1500 to 1800 AD known as "**Little Ice Age**" when several hundreds of people died in Europe, North America and around the world. Throughout the Little Ice Age, the world experienced heightened volcanic activity. When a volcano erupts, its ash reaches high into the atmosphere and can spread to cover the whole Earth. This ash cloud blocks out some of the incoming solar radiation, leading to worldwide cooling that can last up to few years after an eruption. Also emitted by eruptions is sulfur in the form of SO₂ gas. When this gas reaches the stratosphere, it turns into sulfuric acid particles, which reflect the sun's rays, further reducing the amount of radiation reaching Earth's surface. Thus, it is likely that the Ashtapad temple could have been damaged during the first phase of the Little Ice Age in 1550 AD and followed up by the volcano eruptions which blew away the ruins to large distances and finally buried into the mountains or in the water.

4. Proposed Research Plan and New Techniques

Preliminary research has been done regarding the authenticity of both Rishabh Dev and Mt. Ashtapad by eminent scholars and scientists

from India and abroad. Teams of scientists and research scholars from various fields have also visited this area of Mt. Kailash in summer of 2006, 2007 and 2009 for preliminary reconnaissance survey. ARIF has prepared DVDs of findings of these field trips. In addition to the field trips, satellite data have also been critically examined to locate any possible sign of buried structure in Mt. Kailash region. The satellite data includes the images of IRS/LISS-IV which was combined with the map of Mt. Kailash region (1:50000 scale), Published by Karto Atelier of France. The images of IKONOS and IRS satellite employing compatible software have also been critically studied to locate any possible buried structures in the Kailash area. Based on the campaigns, field trips and study of photos and satellite images ARIF has identified about eight potential sites for Mt. Ashtapad. Thus to start with new investigations we must explore the artifacts/ ruins of the Ashtapad temple at these identified locations, as a part of international scientific research programs, however, employing new techniques as described below.

Research Plan employing New Techniques:

The identification of the above sites is based on physical inspection and analyzing the photos taken during field trips or from the images made available through satellites. Further, the selection of the above sites has also been carried out considering archeological, anthropological and geological backgrounds. However, so far in order to probe the Ashtapad temple no in-depth scientific techniques have been used, perhaps in context to restrictions from China government.

We propose to employ ground based spectral and digital imaging and space borne multi-wavelength imagery through remote sensing techniques. We plan to use ground penetrating radar, electromagnetic induction (EMI) and magnetometer to conduct non-destructive and non-invasive surveys. We describe below the preliminary

approach for future research directions to probe the Ashtapad Palace Temple.

a). Ground-based Techniques:

Application of Multi-frequency Ground Penetrating Radars:

The most important and non-destructive exploration techniques include application of multi-frequency radio waves. In this context, the “Ground Penetrating Radar (GPR) and Microwave Remote Sensing Techniques” are most potential to probe the Ashtapad Temple. The Radio waves and Microwave Remote Sensing techniques provide information about the buried objects. Further, the microwave frequencies have unique properties that include day and night capability, all weather capability, penetration through snow and soil, and determination of water content in the soil as well as in snow and any other target material.

The depth of penetration for a given frequency radio wave is maximum in the case of dry snow and dry soil. The depth of penetration also depends upon the frequency, and for lower frequency the penetration depth is larger than higher frequency. This also depends upon look angle as well as polarization and type of surface. It has been observed that in the dry soil the 3.0 GHz frequency radio waves can penetrate up to 30 meter while 1.4 GHz frequency can penetrate better than 30 meters and if we choose further lower frequency like 500 MHz we may expect the penetration depth to be 50 meters. The schematics of fundamental concept of GPR functioning is presented in Figure 14.

On the other hand, in case of dry snow, it is transparent up to 9 to 10 GHz. This suggests that for completely dry snow the frequencies below 9 GHz can look at the bottom of Snow, which means we can probe at the rock or soil below dry snow. However, if snow is wet then it will look at some point in the ice sheet layer and cannot reach to the bottom. Thus during summer period it would be

better to probe the Ashtapad Temple ruins if buried to such an extent of 30-50 meters.

Figure 14 shows the block diagram of the GPR prototype with its major components. It has a microprocessor-based electronic section and a microwave section. The electronic section controls the GPR's operation to perform data acquisition and processing, and to display the measured results. The heart of the GPR is the microwave section that dictates the system's performance as well as its size. It consists of a receiver, a transmitter, and

receiving and transmitting antennas. The pulse generator of the transmitter generates a mono-cycle pulse of 0.33 nanosecond pulse width. The pulse is amplified by the power amplifier and is radiated by the transmitting antenna. The reflected signals from the surface and subsurface will go through the receiving antenna and sampling head to produce a low-frequency signal. This low-frequency signal, containing information of the subsurface conditions, is then amplified by the Intermediate Frequency (IF) amplifier.

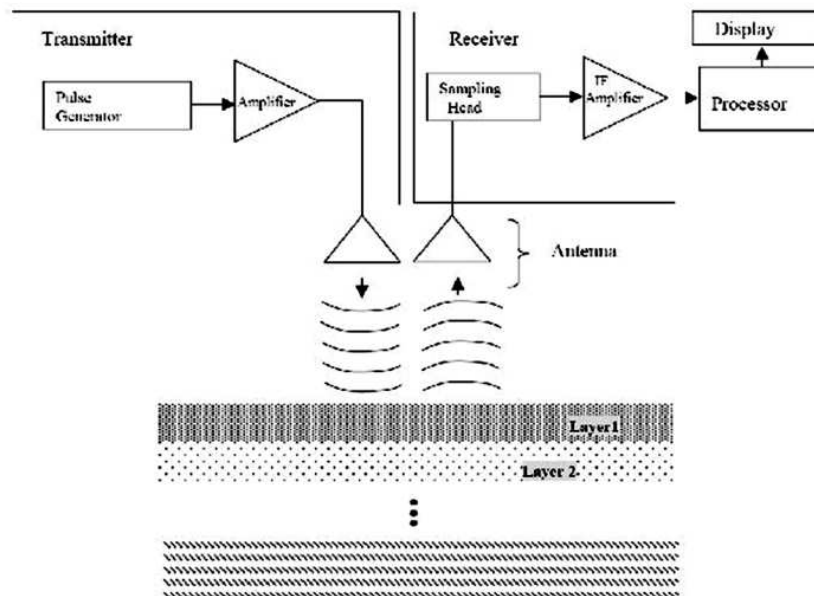


Fig. 14 : Block diagram of fundamental concept of the Ground Penetrating Radar

There are two types of sensors viz. passive and active sensors in microwave domain. The passive sensor receives the self-emission of the target. This self-emission is the function of the dielectric constant of the material, surface roughness, and density of the material. It also depends upon the look angle, polarization and operating frequency as described above.

In case of active sensor like Radar the microwave energy is incident on the target and the reflected/ scattered energy is received. The Scattering Coefficient is the measurer of the

physical and electrical properties of target and of the sensor parameters just as in case of emission from passive sensor.

Individual lines of GPR data represent a sectional (profile) view of the subsurface. Multiple lines of data systematically collected over an area may be used to construct three-dimensional or tomographic images. Data may be presented as three-dimensional blocks, or as horizontal or vertical slices. Horizontal slices (known as “depth slices” or “time slices”) are essentially plan view maps isolating specific depths. Time-slicing has become

standard practice in archaeological applications, because horizontal patterning is often the most important indicator of cultural activities.

Now using these sensors we can locate buried objects. In the case of remnants of Ashtapad temple in the Kailash-Mansarovar area we have to first make a survey of the area and locate the remnants in the identified/ potential sites. However, this part of investigation has already been carried out by ARIF through KM-I, KM-II and KM-III field trips. Further based on these field trips and studying satellite images almost 8-10 potential sites have already been identified. Thus, we propose for locating buried objects first in these identified 8-10 sites, and application of ground-based measurements employing Ground Penetrating Radar (GPR) would be most ideal and easy to implementing as shown in Figure 15, which represents a proposed step of application of GPR towards searching the Ashtapad Temple. Here we can use satellite-based microwave imaging system and airborne data if application of GPR technique would not be possible in context to diplomatic or political reasons.

However, GPR has some limitations *viz.* depth of penetration (typically 1 to 15 meters) is less than direct current (DC) resistivity and electromagnetic (EM) methods, and is further reduced in moist and/or clayey soils and soils with high electrical conductivity. Penetration in clays and in materials having high moisture is sometimes less than 1 meter. Further, the GPR method is sensitive to noise—i.e., interference caused by various geologic and cultural factors. For example, boulders, animal burrows, tree roots, and other phenomena can cause unwanted reflections or scattering. Cultural sources of noise can include reflections from nearby vehicles, buildings, fences, power lines, and trees. Electromagnetic transmissions from cellular telephones, two-way radios, television, and microwave transmitters may also cause noise on GPR records. Shielded antennae are used to limit these types of reflections.

b). Space borne Techniques: Microwave Imaging

Remote sensing and Imaging in Microwaveband

Passive microwave remote sensing offers the potential for measuring many parameters (soil moisture, sea surface temperature, precipitation, *etc.*) important for understanding and monitoring the environment. Remote sensing at frequencies in the microwave spectrum has the advantage that it can be done at night and in the presence of cloud cover, permitting measurements in regions inaccessible to visible and infrared sensors. Frequencies at the lower end of the microwave spectrum respond to the changes in the dielectric constant of the surface. This means a strong response to the presence of water in soils and vegetation, a response to the temperature and salinity of the ocean surface, and response to changes of state (e.g. frozen/thawed). At higher microwave frequencies resonance's of oxygen and water in the atmosphere permit profiles of temperature, pressure and humidity to be measured.



Fig. 15: Schematic generated view of a man along with GPR system heading towards possible site of Ashtapad Mountain in Gyangdrak amphitheatre to probing the buried ruins of the Temple Palace.

Measurements from space offer the potential for global-scale observations necessary for understanding weather, climate and the global environment. However, microwave measurements from space have been limited by the large aperture antennas required to obtain reasonable spatial resolution. Aperture synthesis is a new technology that helps to overcome some of the limitations of size, weight, and scanning associated with real aperture antennas. Microwave imaging with fine spatial resolution is possible from space using aperture synthesis without the need to scan a large aperture. The advantages gained from aperture synthesis come at the expense of reduced sensitivity resulting from the corresponding reduction in physical aperture. Sensitivity is an especially critical issue for measurements made from low earth orbit because the high velocity of the platform (about 7 km/s) limits the integration time available for imaging a particular scene.

Synthetic aperture radar (SAR) is a form of radar in which sophisticated processing of radar data is used to produce a very narrow effective beam. It can only be used by moving instruments over relatively immobile targets. It is a form of active remote sensing - the antenna transmits radiation which is then reflected from the target, as opposed to passive sensing, where the reflection is detected from ambient illumination. The image acquisition is therefore independent of the natural illumination and images can be taken at night. Radar uses electromagnetic radiation with microwave frequencies; the atmospheric absorption at typical radar wavelengths is very low, meaning observations are not prevented by cloud cover. The SAR and Mini-SAR are currently highly capable for remote sensing applications, however, limited to surface applications such as environment, oceans, forestry, landscape, ice and glacier sheets *etc.* But with recent advancement in research and technology very soon the SAR onboard spacecraft will be able to imaging the buried objects in sub-surfaces of the size of the statue of Bhagwan Rishabhdev shown in Figure 16,

where the angular resolution (θ_{HP}) depends upon wavelength λ and aperture D of the object.

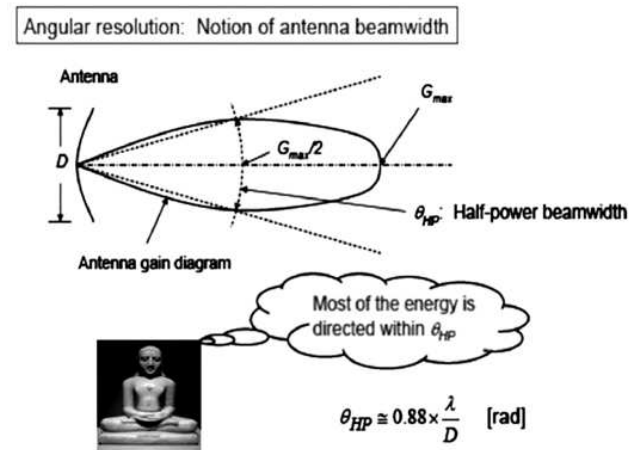


Fig. 16: The microwave synthetic aperture radar (SAR) onboard satellite can search buried object with spatial resolution (θ_{HP}) of the statue of Bhagwan Rishabhdev shown in the picture.

5. Discussions

According to Jain scripture the age of Bhagwan Rishabhdev would be hundreds of thousands of years and the period goes back to before the evolution of the Earth. However, such ill-defined age and period cannot be correlated with reference to scientific data available at present to explore the Ashtapad Temple. Nevertheless, one may go back in time to 10,000 to 20,000 years or even more as better and better scientific studies become available. From the above discussions, it appears that most promising period to look for evidence for Ashtapad Temple would be the period of Gautama Swami when he visited Ashtapad about 2600 years ago. In view of our derivations of the period and age of Bhagwan Rishabhdev in context to Jain scriptures as well as scientific investigations, we may conjecture that period between 10 and 20 thousand years before present would be a possible period to explore the evidences for the existence of the Ashtapad Temple. It appears that the Ashtapad temple became victim of severe climate changes taking place over the earth periodically in general,

and most likely during the period of “*Little Ice Age*” that occurred between 1500 and 1800 AD.

Thus, firstly we must explore the past climate history by reconstructing it spanning over last 30,000 years around Kailash region. One of the ideal techniques for this task would be to investigate the sediment core from Mansarovar Lake and other nearby lakes. A core of say ~10 m may go back in time to 30000 years. The core from Mansarovar will be useful for studies of local and global climate, the Himalayan erosion, cultural, social, Archeological and even geological aspects (geomagnetism, biological changes *etc.*). In parallel to this task discovering the Mt. Ashtapad using radio waveband technique should also be undertaken. ***However, it is needless to emphasize that currently Mt. Kailash - Mansarovar region, and hence Mt. Ashtapad, is in the territory of China, and for any such exploration permission from the China Government is utmost necessary.***

Acknowledgements

Author expresses sincere thanks to Ashtapad Research International Foundation (ARIF), Jain Center of America, New York for involving him in the research team and for providing research material on the subject. He is grateful to Dr. Rajnikant Shah, USA, PI of the Project, Dr. Jitendra Shah, Director, L. D Institute of Indology, Ahmedabad, Prof. Narendra Bhandari and Dr. Navin Juyal of PRL, Ahmedabad, and Dr. P.S. Thakkar of SAC/ISRO, Ahmedabad for several useful discussions.

REFERENCES

- Beek van der; Peter van Melle; Jérémie Guillot; Stéphane Pêcher; Arnaud Reiners; Peter W. Nicolescu; Stefan L. Mohammad, 2009, *Nature Geoscience*, Volume 2, Issue 5, p. 364-368
- Bhatt, Nipa J.; Jain, Rajmal; Aggarwal, Malini, 2009, *Solar Physics*, Volume 260, Issue 1, p.225-232.
- Carretier, S.; Poisson, B.; Vassallo, R.; Pepin, E.; Farias, M., 2009, *Journal of Geophysical Research*, Volume 114, Issue F2, doi:10.1029/2008JF001080.
- Enkelmann, E.; Ehlers, T. A.; Zeitler, P. K.; Hallet, B., 2011, *Earth and Planetary Science Letters*, Volume 307, Issue 3-4, p. 323-333.
- Johanson, Donald C. and Edey, Maitland A., 1984, *Lucy: The Beginning of the Human Kind*, published by Simon and Schuster, New York, USA.
- Lave', J. and Avouac, J. P., 2000, *Journal of Geophysical Research*, Volume 105, No. B3, p. 5735-5770.
- Lave', J. and Avouac, J. P., 2001, *Journal of Geophysical Research*, Volume 106, No. B11, p. 26,561-26,591.
- Li, B, Li, J, Cui, Z. 1991. (eds). Quaternary glacial distribution map of Qinghai-Xizang (Tibet) Plateau 1:3,000,000. Shi Y (Scientific Advisor). Quaternary Glacier, and Environment Research Center, Lanzhou University, China.
- Li, B., 1998, Lake development in the Tibetan Plateau. In: Shi, Y., et al. (Ed.), Uplift and Environmental Changes of Qinghai-Xizang (Tibetan) Plateau in the Late Cenozoic. Guangdong Science and Technology Press, Guangzhou, p. 331-346 (in Chinese).
- Prabhu, T. P.; Anupama, G. C., 2010, *Interstellar Matter and Star Formation: A Multi-wavelength Perspective*, ASI Conference Series, Vol. 1, p. 193-201 Edited by D. K. Ojha.
- Seong, Yeong Bae; Owen, Lewis A.; Robert, Yi, Chaolu.; Finkel, Robert C., 2009, *Geological Society of America Bulletin*, Volume 121; No. 3/4; p. 348-365; doi: 10.1130/B26339.1.
- Tang, L., Shen, C., Kong, Z., et al., 1998, Pollen evidence of climate changes during the last glacial maximum in eastern Qinghai-Xizang Plateau, *Journal of Glaciology and Geocryology*, Volume 20 (2), p. 133-140 (in Chinese).
- Yafeng Shi, 2002, *Quaternary International* 97-98, p. 79-91.

Discovery of Lost - II
Reminiscence of lost measures of space and time and their
relation to modern science

Prof. (Dr.) Rajmal Jain
Former Professor and Senior Scientist,
Physical Research Laboratory, Dept. of Space,
Ahmedabad, Gujarat, India

Abstract

Space and time have always been fascinating and therefore a center of attraction for religion, philosophy and science. Identification of number of celestial objects and their measurement in context to length, area and motion have been important tasks since the evolution of human being. In parallel the man came across to problem of weighing the objects ranging from micro to macro in size, known as *mass*, and measurement of change of an object called *time* (kaal). As a function of evolution of human being and increasing his talent he discovered some methods to measure length, mass and time. Significant work was done by our ancestors in general and by Rishi/ Muni and Monks in particular in last several thousands of years. However, in philosophy as well as in most of the religions these three important aspects (length, mass and time) have either been defined qualitatively or in the units, which have not been successfully converted to understandable form in present time. These three fundamental quantities are essential to understand the space and time. The units of space and time in religious and science domain reveal paradox and thus needs to understand them considering highest importance so as to enable us to compare the space and time models proposed by different religions and science. In this article we have made an attempt to transforming these historical and religious units of space and time into modern science.

The philosophy of space and time was both an inspiration and a central aspect of early analytic philosophy. The subject focuses on a number of basic issues, including whether or not space and time exist independently of the mind, whether they exist independently of one another, whether time is a unidirectional flow, whether times other than the present moment exist, and many more questions related to identity of time in the past and over spatial scales. However, no unambiguous definition and quantitative aspects of space and time were proposed until the *Vedas*, the earliest texts on Indian philosophy and Hindu philosophy, dating back to the late 2nd millennium BC, described ancient Hindu cosmology. Accordingly the universe goes through repeated cycles of creation, destruction, and rebirth, with each cycle lasting 4,320,000

years. However, in early last millennium, in contrast to Hindu philosophy, ancient Greek philosophers believed that the universe had an infinite past with no beginning, but again in contrast to this philosophy medieval philosophers and theologians developed a new concept of the universe having a finite past with a beginning. This view was inspired by the creation belief shared by the three non-Vedic religions: Judaism, Christianity, and Islam. However, in contrast to this concept, Jainism favors ancient Greek philosophy with “infinite past and no beginning”. Most important aspect of Jainism in contrast to any other religions is well defined space and time in greater detail with quantitative descriptions. This enables a unique opportunity to compare the space and time models described in Jainism with that of currently advanced science.

In context to such contradictory philosophies and vast questions, in this article we have attempted to address few questions considering various philosophical, religious and scientific models till recent time. We begin with the era of Shree Rishabhdevji, neolithic period around 12000 years B.P, and present brief description of system of units employed during that period and follow to the system of units during Mohenjo-daro and Harappan Indus civilization, 3000-1900 BCE, We give detailed study of units of length starting from Atharvaveda Jyotisa (AJ) to Jaina astronomy and compare within different system of units and current modern system of units. We describe the concepts of time, length and graduation of zodiacal circumferences. We also describe planets and other celestial bodies in the solar system as discussed in Jainism and compare with our current knowledge in the modern astronomy.

The brief concept of measurement of time described in various religions in general and in Jaina canonical texts in particular has been presented in detail in context to evolution of time of the day. Further, the measurement of time employing shadow techniques, however, like sextant where smaller grids were engraved for better time resolution, has been presented.

In order to understand the cosmological distances in the universe we first describe in great detail the concepts of diurnal and declination circles in Jainism. We give examples of distances estimated for the Earth from the Sun and the Moon. We also consider the estimation of the extension of the Jaina universe (14 *rajju*) and compare with the present knowledge of length of the universe in one dimension. These exercises enable us to compare the units of space and time from microscopic to macroscopic scales in Jainism with that described in the modern science. We briefly describe the cosmological models of Hindu, Jaina and modern science and compare them. At the end we briefly describe currently developed 9 dimension TDVP science model, which employs 3-dimensions of each - space, time and consciousness with reference to pre-historic concept of Jainism.

Key words: Space – Yojana, Rajju; Time - Samaya, Muhurta

Scriptures Quoted: Anuyogdwara Sutra; Jaina Astronomy; Triloya Pannati; Atharvaveda Jyotisha, Modern astronomy, TDVP model

1. Introduction:

Recently Jain, Rajmal and Jain, Anupam (2017) published an article “*Jain Units of Space and Time*” in which they considered conversion of units of space and time described in Jain canonical texts to modern science. However, in this article I am considering units of length and time since Neolithic period (~12000 years B.P.) and their variation as a function of history of time. The aim of this article is to revive the historical units of measure of space and time on one hand and simultaneously on the other hand to make it as a reference document to help all those who frequently require conversion of ancient units to modern science units for their research as well as for writing articles/books.

The philosophy of space and time was an inspiration since inception as well as a central aspect of early analytic philosophy. The earliest recorded western philosophy of time was expounded by the ancient Egyptian thinker Ptahhotep (c. 2650–2600 BC), who said, "Do not lessen the time of following desire, for the wasting of time is an abomination to the spirit." The *Vedas*, the earliest texts on Indian philosophy and Hindu philosophy, dating back to the late 2nd millennium BC, describe ancient Hindu cosmology, in which the universe goes through repeated cycles of creation, destruction, and rebirth, with each cycle lasting 4,320,000 years (Thompson, 2007). Ancient Greek philosophers, including Parmenides and Heraclitus, wrote essays on the nature of time (Dagobert, 1942). On the contrary, Incas regarded space and time as a single concept, named *pacha* (Atuq, 1994; Stephen and Richard, 2003; Paul and Catherine, 2004). On the other hand, Plato, in the *Timaeus*, identified time with the period of motion of the heavenly bodies, and space as that in which things come to be. Aristotle, in Book IV of his *Physics*, defined time as the number of change with respect to before and after, and the place of an object as the innermost motionless boundary of that which surrounds it. But St. Augustine (1909) presented the first philosophical argument for the reality of Creation (against Aristotle) in the context of his discussion of time, saying that knowledge of time depends on the knowledge of the movement of things, and therefore time cannot exist or begin without creatures or motions (City of God Book XI ch. 6).

In contrast to ancient Greek philosophers who believed that the universe had an infinite past with no beginning, medieval philosophers and theologians developed the concept of the universe having a finite past with a beginning. This view was inspired by the creation belief shared by the three non-Vedic religions also called as Abrahamic religions: Judaism, Christianity, and Islam. The Christian philosopher John Philoponus presented another early argument against the ancient Greek notion of an infinite past. His views were adopted by many, including, most notably, early Muslim philosopher Al-Kindi (Alkindus), Jewish philosopher Saadia Gaon (Saadia ben Joseph), and Muslim theologian Al-Ghazali (Algazel). They used his two logical arguments against an infinite past, the first being the "argument from the impossibility of the existence of an actual infinite", which states (Craig, 1979) that an actual infinite cannot exist. "An infinite temporal regress of events is an actual infinite; however, an infinite temporal regress of events cannot exist." The second

argument, the "argument from the impossibility of completing an actual infinite by successive addition" (Craig, 1979), states that "The temporal series of past events has been completed by successive addition but the temporal series of past events cannot be an actual infinite." Both arguments were adopted by later Christian philosophers and theologians, and the second argument in particular became more famous after it was adopted by Immanuel Kant in his thesis of the first antinomy concerning time (Craig, 1979).

In 1788, Immanuel Kant published the *Critique of Pure Reason*, one of the most influential works in the history of the philosophy of space and time. He described time as an *a priori* notion that, together with other *a priori* notions such as space, allows us to comprehend sense experience. Kant denied that either space or time are substance, entities in them, or learned by experience; he holds, rather, that both are elements of a systematic framework we use to structure our experience. Spatial measurements are used to quantify how far apart objects are, and temporal measurements are used to quantitatively compare the interval between (or duration of) events. Although space and time are held to be *transcendentally ideal* in this sense, they are also *empirically real*—that is, not mere illusions.

The great debate between defining notions of space and time as real objects themselves (absolute), or mere orderings upon actual objects (relational), began between physicists Isaac Newton (via his spokesman, Samuel Clarke) and Gottfried Leibniz in the papers of the Leibniz-Clarke correspondence. Arguing against the absolutist position, Leibniz offers a number of thought experiments with the purpose of showing that there is contradiction in assuming the existence of facts such as absolute location and velocity. These arguments trade heavily on two principles central to his philosophy: the principle of sufficient reason and the identity of indiscernible. The principle of sufficient reason holds that for every fact, there is a reason that is sufficient to explain what and why it is the way it is and not otherwise. The principle of “identity of indiscernible” states that if there is no way of telling two entities separate then they are one and the same thing, which, however, is not valid due to restrictions in observing limits (Jain, 2008, 2014).

However, in contrast to Immanuel Kant (1788 A. D.), Jainism considers *space* and *time* as important substances in addition to *Jiva* and *Pudgala* of the universe. Therefore Jainism considers defining these two aspects quantitatively though asymptotically and to first approximation employing various techniques (Jain, 2014). It should be noted, however, that original texts of Jainism known as *Āgamas* are based on Mahavira’s teachings that compiled sometimes between 4th and 3rd centuries from the orally passed on from teachers to the disciples for several centuries. On the contrary, according to Digamber philosophy, the true *Āgamas* and *Pūrvas* currently do not exist, and everything is finished with the death of Āchārya Bhadrabāhu Swāmī (433-357 B. C.) and Sthulabhadra Swāmī in 3rd century B. C. (Jain, 2015).

Therefore, texts related to Jainism incorporated in the current article should be considered based on the restricted knowledge after Pujya Bhadrabāhu and Pujya Sthulabhadra, which was written and passed over by monks over one to next generation in last 2300 years (Jain, 2015).

Thus significant scope exists for various corrections/modifications in the re-written manuscripts, understanding and interpretation of original oral texts, translation from one language to other language, and finally interpretation of fundamental concepts of *Sūtras* in general and *Units* in particular that might have occurred in last 2000 years after the invention of the paper, perhaps first time in China..

In contrast to religions and particularly Jainism the Science is more recent but well developed and quantifies units more precisely. Currently we read, talk and write each quantity in units of science, which is rather better understandable. In this context, we compare units of length, area (space) and time described in Jainism and other religious domains with currently known units in science so that historical religious texts may be used for modern research and communication.

2. Units of Space:

2.1 Historical Perspectives:

The very earliest civilizations also needed measurement for purposes of agriculture, construction, and trade. The earliest recorded systems of weights and measures originate in the 3rd or 4th millennium BC. Early standard units might only have applied to a single community or small region, with every area developing its own standards for lengths, areas, volumes and masses. Often such systems were closely tied to one field of use, so that volume measures used, for example, for dry grains were unrelated to those for liquids, with neither bearing any particular relationship to units of length used for measuring cloth or land. With development of manufacturing technologies, and the growing importance of trade between communities and ultimately across the Earth, standardized weights and measures became critical. Starting in the 18th century, modernized, simplified and uniform systems of weights and measures were developed, with the fundamental units defined by ever more precise methods in the science. The discovery and application of electricity was one factor motivating the development of standardized internationally applicable units.

The earliest known systems of measures of length and time appear to have been created at some time in the Neolithic Period, about 10000 years BC, the era of Bhagwan Rishabhdev (Jain, Rajmal, 2012, 2017). He demonstrated from the records that length was first measured employing organs of the body *viz.* the forearm, hand, finger *etc.* and that time was measured by the periods of the sun, moon, and other heavenly bodies as well as the shadow of the Sun (Jain and Jain, 2017). The units of length were known as the dhanus, or *dhanush* (bow), the *krosa* (cow-call) and the *yojana* (stage) *etc.* The magnitude of any unit was referred with *koda*, *kode and kodi*, and will be discussed in this article. The time was measured in units of *ghadi*, *prahar*, *purva* *etc.* However, when it was necessary to compare the capacities of containers such as gourds or clay or metal vessels, they were filled with plant seeds which were then counted to measure the volumes. When means for weighing were invented, seeds and stones served as

standards. For instance, the *carat*, still used as a unit for gems, was derived from the carob seed. Such measurements schemes continued even in the 4th and 3rd millennia BC among the ancient people civilization of Egypt, Mesopotamia and the Indus Valley, and perhaps also in Elam (Iran) as well.

After Indus-Saraswati civilizations (3300-1300 BCE) the evidences from all available sources, and by correlating the relevant facts, we obtain some idea of the origin and development of the units. However, we find that they have changed more or less gradually with the passing of time in a complex manner because of various modifying influences. We may summarize the official measurement systems for large societies into historical systems that are relatively stable over time, including: the Babylonian system, the Egyptian system, the Phileterian system of the Ptolemaic age, the Olympic system of Greece, the Roman system, the British system, and the metric system. However, in spite of empire influences, man has always been fascinated by religion and the cosmic phenomena. It was customary among ancient Chinese and Indian that several astronomical changes were accorded with the advent of any new regime (Jain and Jain, 2017; Yabuuti, 1974). Apropos such traditions length-units had undergone a multitude of alterations at several places in ancient time and it took couples of centuries before they were finally fixed to understandable forms. For example, King Henry I of England had decided that the standard *yard* should be the length of his arm but in reign of Edward II, a new law said that one inch should be the length of three grains of barley, end to end (Lishk, 1980). In India, Hamanyun had ordered the length of a yard to be equal to sum of diameters of 42 Sikandari Coins or 42 finger-widths. Akbar settled his *Ilahi Gaz* (Divine yard) for 41 finger-widths which worked out to be 29.63 inches, but with the advent of British influence over India, the Ilahi Gaz (yard) was fixed at 33 inches (Verma, 1974). However, in 1878, after fixing length of a yard, it was further fixed that 1700 yards make a *mile*.

There was a great diversity in the measurements of length in different parts of the world in general and particularly in ancient India. For example the large variations in the Indian *Kosa* most have puzzled the Chinese pilgrims and perhaps that is why FA-hian (399-413 A. D.) used Indian measure “*yojana*”, whilst Hwen-thsang (629-645 A. D.) used his native measure “*Li*”. Thus we conclude that *angula* and *yojan* to *yard* and *mile*, and to *meter* in present modern system are the most important historical developments for measurement of small scale to large scale length. We found that small and large scale measurements of length were invented and better described in Jaina canonical texts and in this context, we present in this article the mystery of the conspicuity of system of length-units propounded in Jaina canonical literature as well as complexity in the relation between *yojana* and British mile. We also describe the measurement of cosmic distance in Jain and modern systems.

2.2 Units of Length in Jain System:

Angula (finger-width) was used fundamentally as a prominent unit of length in ancient India, and multiple and sub-multiple units were derived from it. The primeval record of three different magnitudes of an *angula* (finger-width) is found in Jaina **Anuyogadvara Sutra** (ADS)

of which *ADS 149.12* sutra states: there are three kinds of an **angula** viz. atamangula; utsedhangula and pramanangula.

ADS sutra further states that a finger-width of a person is called Atamangula because 12 finger-widths (angula) makes one's face length, and nine times the face-length equals the height of the person. The utsedhangula is half of the finger-width (atmanagula) of Bhagwan Mahavira. Further, one thousand times of utsedhangula is the length of one pramanangula. The various **angulas** are thus inter-related as follows.

$$1 \text{ utsedhangula} = 1/2 \text{ atmanagula}$$

$$1 \text{ pramanangula} = 1000 \text{ utsedhangula} \\ = 500 \text{ atmanagula}$$

The above three units of finger-width or system of units have end relationship with **yojana** as presented in **Table I**.

Table I

| Jain ADS units of Length | |
|---------------------------------|-------------------------------|
| Sub-Units | Equals to |
| 6 angulas (finger-width) | 1 pada (length of human foot) |
| 2 padas | 1 vitasti (span) |
| 2 vitastis | 1 ratni |
| 2 ratnis | 1 kuksi |
| 2 kuksis | 1 dhanusa (bow) |
| 2000 dhanusas | 1 gavyuti |
| 4 gavyutis | 1 yojana |

The above Table I enables us to compute 1 **yojana** = 768000 **angulas**, which according to sub-divisions of angula mentioned above provides us to measure yojana also in three sub-divisions as follows.

$$1 \text{ atma yojana} = 768000 \text{ atmangulas}$$

$$1 \text{ utsedha yojana} = 768000 \text{ utsedhangula}$$

$$1 \text{ pramana yojana} = 768000 \text{ pramanangulas}$$

Or else we may say that

$$1 \text{ pramana yojana} = 500 \text{ atma yojana,} \\ = 1000 \text{ utsedha yojana}$$

We also include the units of length described in *Tiloyapannatti* (TP) (Jain, 1958) and present in **Table II**.

Table II

| Jain TP units of Length | |
|--------------------------------|-------------------------------|
| Sub-Units | Equals to |
| Infinitely many paramanus | 1 avasannasanna skandha |
| 8 avasannasanna skandha | 1 sannasanna skandha |
| 8 sannasanna | 1 trutarenu |
| 8 trutarenu | 1 trasarenu |
| 8 trasarenu | 1 ratharenu |
| 8 ratharenu | 1 uttama bhogbhumi balagra |
| 8 uttama bhogbhumi balagras | 1 madhyama bhogbhumi balagra |
| 8 madhya. bhog. balagras | 1 jaghanya bhogbhumi balagra |
| 8 jagh. Bhog. balagras | 1 karma bhumi balagra |
| 8 karma bhumi balagras | 1 liksa |
| 8 liksas | 1 yuka (louse) |
| 8 yukas | 1 yava (barley corn) |
| 8 yavas | 1 angula (finger width) |
| 6 angulas | 1 pada (length of human foot) |
| 2 padas | 1 vitasti (span) |
| 2 vitsastis | 1 hasta (fore arm or cubit) |
| 2 hastas | 1 kisku |
| 2 kiskus | 1 danda or dhanusa |
| 2000 dandas or dhanusas | 1 kosa |
| 4 kosas | 1 yojana |

We would like to mention that Buddhistic *yojana* is slightly smaller than Jaina *yojana*.

1 Buddhistic yojana = 384000 X 7 yavas

1 Jaina yojana = 768000 X 8 yavas

Thus

$$1 \text{ Buddhistic yojana} = 7/16 \text{ Jaina yojana (ADS units)}$$

Further, considering above tables I and II it may further be easily computed that 1 *dhanusa* = 96 *angulas* and 1 *kosa* = 96000 *angulas*.

It has also been known that 1 angula (finger-width) is equal to ~18.5 mm of modern science units, which reveals that 1 dhanusa = 96 angulas = 18.5X96 = 1776 mm = 1.776 meter = 72.49 inch = 6.040 feet.

More recently Pokharna (2013) described measurement of length that found in the Jaina literature. According to him infinitely many parmanus form one Avasannasannaskhandha., and 8 Avasannasanna units = 1 Sannasannaskandha. However, the parmāṇu has been defined as the smallest particle of matter having no length, no breadth and no height. Pokharna (2013) mentions that parmāṇu is defined as a particle which can be only thought of but is not practically perceivable, which has no significance in science because physical particle must have some dimension, may be of extremely small magnitude. Thus infinitely large number of parmāṇus makes one Avasannasanna skhandha, so we cannot conclude this as quantitative definition at lower end. But Pokharna (2013) attempted to estimate the size of Avasannasanna skhandha considering the breadth of finger as 2 cm. According to him one angula (finger breadth) is equal to 8^{12} size of avasannasanna skandha, which gives one avasannasanna skandha = 2×8^{-12} cm. However, it may be noted that average finger breadth (width) of modern man is about 1 cm (10mm) and not 2 cm.

2.3 Relationship between Yojana and British Miles:

In context to foregoing tables and discussions it is very difficult to derive precise relationship between yojana and British miles because it will depend upon selection of units. According to Dwivedi (1959) yojana is considered as half-yojana (2 kosa) and thus equal to 5 miles. On the contrary, according to Jain (2014) 1 *yojan* = 10 *miles* based on the estimation of diameter of the Earth by Brhamagupta (628 A. D.) and Bhaskaracharya (1114-1185 A. D.), which turns out to be 7905 miles, very close to that estimated by modern scientists of the order of 7917 miles (12742 km). They considered yojana to be equal to 10 miles based on 1 *yojana* = 4 *kosas*. The controversy is due to considering different value of *kosa* in different parts of India. For example, Punjabi yojana = 5 miles; Gangetic province yojana = 9 miles; Bundelkhand yojana = 16 miles. However, according to Kaye (1923), Sir Fleet (1907) and Sharma (1952) Sir John Bellentine estimated *yojana* to be equal to $9\frac{1}{11}$ miles, while, on the contrary, Prof. L. C. Jain (1958) estimated to be 4545.45 miles. Thus Jain (2014) reviewed the controversy in context to Jaina canonical units of length and accordingly he interprets:

$$1 \text{ atma yojana} = 9 \frac{1}{11} \text{ miles} = 14.55 \text{ km}$$

$$1 \text{ utsedha yojana} = 4 \frac{6}{11} \text{ miles} \approx 5 \text{ miles}$$

and,

$$1 \text{ pramana yojana} = 500 \times 9 \frac{1}{11} = 4545.45 \text{ miles}$$

$$= 7315.1927 \text{ km}$$

Thus according to Jain (2014) earlier derivation of *yojana* to be referred to *atma yojana* (fundamental yojana), and that by Prof. L. C. Jain to be referred to *pramana yojana*. Perhaps on geological scale *atma yojana* is good enough while for celestial/ cosmic scale pramana yojana may be necessary. Earlier, Jain (2001) derived yojana based on the study of Moon and other celestial objects and proposed the *yojana* to be equal to ~5000 km, somewhat close to *pramana yojana*.

In above context, we would like to briefly discuss the spatial unit *yojana* with reference to celestial mechanics as shown in **Figure 1** and described as follows considering Mt. Meru as centroid of the Earth.

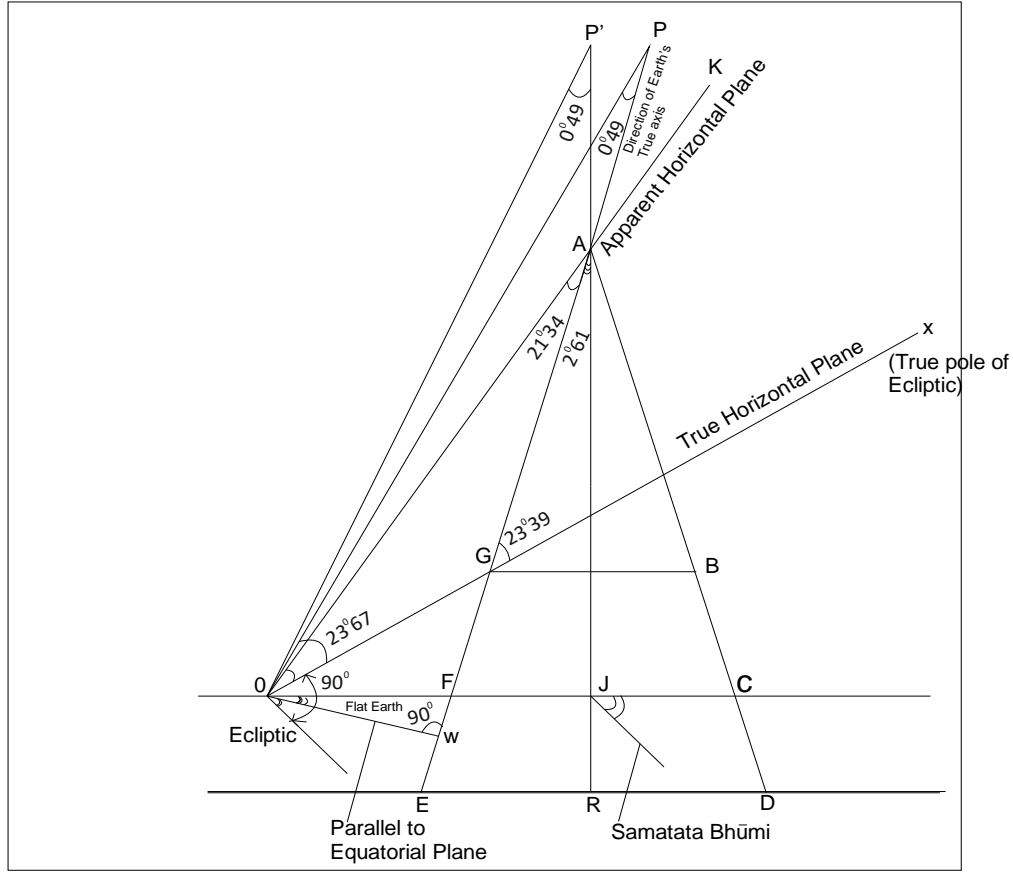


Figure 1: The approximate form of the Mount Meru (perhaps the Everest)

The Sun, while occupying the innermost mandala (Sun's diurnal path on Summer solstice day) is 800 Y (yojana) distant from *samtala bhumi* ("Earth having a plane surface", denoting circular area with center at the projection of pole of ecliptic (Lishk and Sharma, 1975). Position of the Sun while describing innermost mandala also lies on the periphery of *Jambudwipa* (Lishk and Sharma, 1978) (isle of Jambu tree) of radius equal to 50000 y. Thus on the summer solstice day, the distance D of the Sun from the axis of **Meru** supposed to have been placed at the center of Jambudwipa is given as follows.

$$\begin{aligned}
 D &= 50000 \text{ y (atma yojana; ADS units)} \\
 &= 100 \text{ y1 (pramana yojana; ADS units)} \\
 &= 800 \text{ Y (yojana; TP units)}
 \end{aligned}$$

This gives relationship between two systems of units as

$$50000 \text{ y} = 800 \text{ Y}$$

$$1 \text{ y (atma yojana ADS)} = \frac{8}{500} \text{ Y (Yojana TP)}$$

However, it should be born in mind that the tentative axis of **Meru** always remains at a distance equal to the radius of **Meru** on the flat Earth (*cf.* Figure 1), apart from true axis of the earth. Radius of the Meru on the flat Earth is given to be 5000 y or 80 Y. Thus the distance between true axis of the earth and the Sun describing the innermost mandala is given as:

$$= \text{Radius of Jambudwipa} - \text{radius of } \mathbf{Meru} \text{ on flat earth}$$

$$800 \text{ Y} - 80 \text{ Y} = 720 \text{ Y}$$

On the other hand, we know that celestial distances are measured in terms of corresponding distances projected over the surface of the Earth (solid angle). Let us consider δ_{\max} be the maximum declination of the Sun. Thus on the summer solstice day, north polar distance of the Sun equals the distance of the Sun from true axis of the earth.

$$\text{Thus} \quad 90^\circ - \delta_{\max} = 720 \text{ Y} \quad (1)$$

Further, we also know that the Sun traverses a distance of 510 Y from the innermost mandala to outermost mandala (Sun's diurnal orbit on winter solstice day) and vice versa (Lishk and Sharma, 1978); Lishk and Sharma, 1974).

$$\text{Hence} \quad 2 \delta_{\max} = 510 \text{ Y} \quad (2)$$

Comparing and solving eqⁿ. (1) and (2), we get

$\delta_{\max} = 23.541^\circ$, a true value within the error limits (due to approximation), however corresponds well with modern science declination values.

Now realizing that $1'$ (arc-minute) = 6080 feet, thus $1^\circ = 364800$ feet

We also know that 10000 feet = 1.95 miles, so $1^\circ \sim 71.14$ miles, therefore

$$510 \text{ Y} = 2 \delta_{\max} = 47 \times 71.14 \text{ miles}$$

Which, however, results in $1 \text{ Y} = 6.56$ miles (actual British road distance)

We would like to mention that above results are derived employing a notion of measuring celestial distances projected along the circumference of the earth, whereas Jains were not aware of various rotation and revolution of the earth. Nevertheless, in conclusion, according to Jaina there exist three different systems of measurement of length viz. *atma* system, *utsedha* system and *pramana* system. Correspondingly any unit of length will have three different magnitudes (ADS units) related to each other as follows.

$$1 \text{ pramana unit} = 500 \text{ atma unit} = 1000 \text{ utsedha unit,}$$

, and relation among system of units as follows

$$1 \text{ ADS unit} = 8 \text{ T. P unit} = \frac{7}{8} \text{ Buddhistic unit} \quad (3)$$

2.4 Celestial measurements as described in Jaina Cosmology:

In contemporary astronomy in general and Vedic astronomy in particular calculations to estimate the relationship between geocentric and heliocentric were based on celestial mathematics as demonstrated in **Figure 2** where calculation for a planet is presented.

Lunar Zodiac of the Rig-Vedic Hindu system consists of 27 nakshtras (asterisms). On the contrary, Jainas first measured zodiacal stretches of nakshtras in time degree (space-time) and included Abhijit (α Lyrae) nakshtra to account for the discrepancy in lunar motion. We present a simple probe into the series of development of graduating zodiacal circumferences into $27\frac{21}{67}$ days of nakshtra's month (lunar sidereal revolution period). This subsequently graduates into $819\frac{27}{67}$ muhūrtas of a nakshtra month, 54900 muhūrtas of a 5 year cycle and 360 saura days (period taken by the Sun to move on 1/360 part of the zodiacal circle) finally leading to the development of equal amplitude system of nakshtras. This led to drop again Abhijit nakshtra with the advent of Saidhantik Astronomy. Here it is essential to introduce that the Jaina Astronomy has a peculiar theory of two Suns, two moons and two sets of nakshtras (Bose et al., 1971), which states:

“In Jamboodwipa two moons illuminated, are illuminating and will be illuminating; two Sun shone, are shining and will be shining; and 56 nakshtras viz. 2 Abhijit (α Lyrae); 2 Sravanas (α Aquilae); 2 Uttrardhas (α Saggittarii), occulted, are occulting and will be occulting...two moons”.

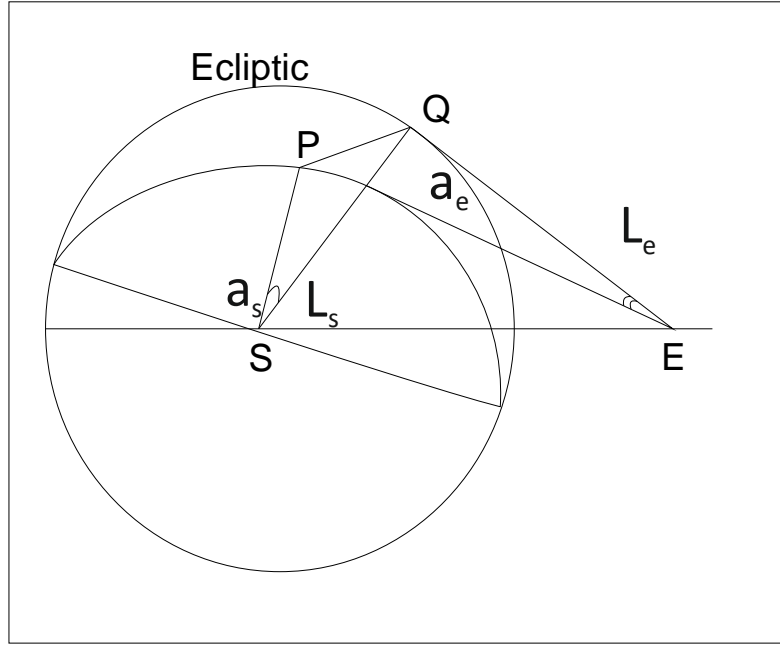


Figure 2: Technique to estimate the relation between geocentric and heliocentric latitudes of a planet. $SP = a_s$ = Radius vector of the planet with respect to the Sun. $EP = a_e$ = Radius vector of the planet with respect to the Earth. Where, S= Sun, E= Earth and P = Planet

$\angle PSQ = L_s$ = Heliocentric latitude of P.

$\angle PEQ = L_e$ = Geocentric latitude of P.

Here we do not wish to enter into the debate of the mystery of real versus counter bodies of texts existed in the Jaina Prakrit, Chinese, Greece and ancient Babylon **but one will find actually a single set of nakshtras constituted the lunar zodiac of Jaina.** (Jain, 1975). Thereby we may estimate that: zodiacal stretch (ZS) of every nakshtra which may be expressed in time units of muhūrtas (1 muhūrta=48 minutes). In this context, Jaina Prakrit states that “Abhijit combines with moon for $9 \frac{27}{67}$ muhūrtas. In **Figure 3** we present a simple geometrical sketch to demonstrate the celestial latitude of Moon implied in the concept of ‘height’ above Samatala bhūmi (‘earth having a plane surface’ with center at the projection of pole of ecliptic).

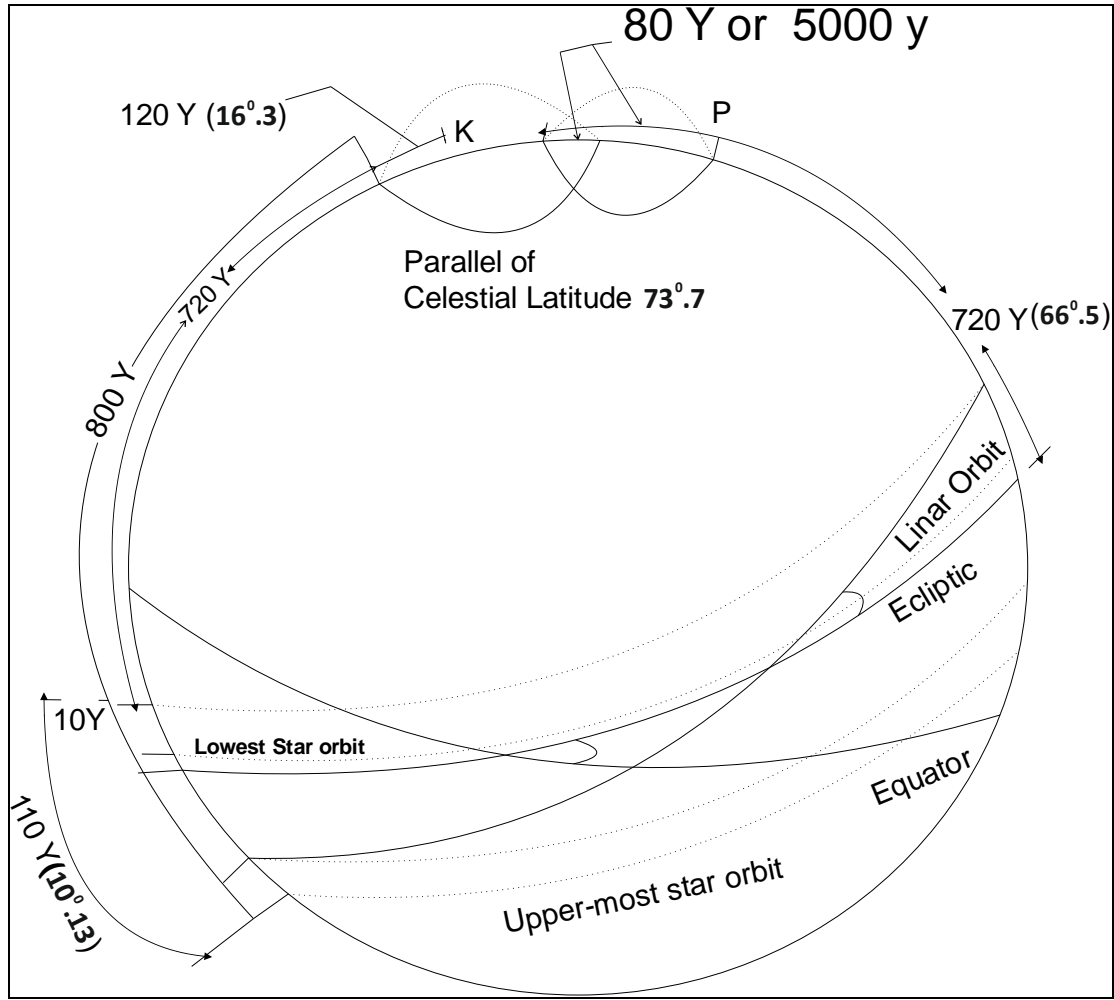


Figure 3: Notion of celestial latitude of Moon implied in the concept of ‘height’ above Samatala bhūmi (‘Earth having a plane surface’ with center at the projection of pole of ecliptic).

The estimates of zodiacal stretch of each nakshtras are presented in **Table III**.

Table III

| Table of Nakshtras and their zodiacal stretches in Muhūrtas | | | |
|---|-----------|---------------------|-------------------|
| S. No. | Nakshtra | Astronomical Name | ZS (Muhūrtas) |
| 1. | Abhijit | (α Lyrae) | $9 \frac{27}{67}$ |
| 2. | Sravana | (α Aquilae) | 30 |
| 3. | Dhanisiha | (β Delphini) | 30 |

| | | | |
|-----|-----------------|-----------------------|----|
| 4. | Satabhisa | (λ Aquarii) | 15 |
| 5. | Purvabhadrapada | (α Pagasi) | 30 |
| 6. | Uttarabhadra | (γ Pagasi) | 45 |
| 7. | Revati | (ξ Piscium) | 30 |
| 8. | Asvini | (β Arietis) | 30 |
| 9. | Bharani | (δ Arietis) | 15 |
| 10. | Krutika | (η Tauri) | 30 |
| 11. | Rohini | (α Tauri) | 45 |
| 12. | Margsirsha | (λ Orionis) | 30 |
| 13. | Ardra | (α Orionis) | 15 |
| 14. | Punarvasu | (β Geminorum) | 45 |
| 15. | Pusya | (δ Cancr) | 30 |
| 16. | Aslesa | (ϵ Hydrae) | 15 |
| 17. | Megha | (α Leonis) | 30 |
| 18. | Purvaphalguni | (δ Leonis) | 30 |
| 19. | Uttaraphalguni | (β Leonis) | 45 |
| 20. | Hasta | (δ Corvi) | 30 |
| 21. | Chitra | (α Virginis) | 30 |
| 22. | Swati | (α Bootis) | 15 |
| 23. | Visakha | (α Libra) | 45 |
| 24. | Anuradha | (δ Scorp | 30 |
| 25. | Jyeshtha | (α Scorp | 15 |
| 26. | Mula | (λ Scorp | 30 |
| 27. | Purvasadha | (δ Sagittari) | 30 |
| 28. | Uttarasadha | (σ Sagittari) | 45 |

We can easily compute from the Table III that

$$\sum_{n=1}^{n=28} (ZS)n = 819 \frac{27}{67} \text{ muhūrtas} = \text{length of a nakshtra month (sidereal revolution of the moon)}$$

Where n is the serial number of nakshtras, starting from Abhijit as 1.

Further, 67 nakshtra months corresponds to 1 Yuga (5 year cycle)

= 1830 days, and each day of 30 muhūrtas (24 hours)

This suggests that lunar zodiacal circumference has been graduated in $819 \frac{27}{67}$ muhūrtas of a nakshtra month. This view is further strengthened by the fact that the zodiacal positions of the Moon and Sun are also defined in terms of balance of muhūrtas of nakshtras occupied by them respectively.

We know that on the full moon day (Purnima), $L_s \sim L_m$ = half the zodiacal circumference, where L_s and L_m are the longitudes of the Sun and Moon on the full-moon day respectively.

Thus, $L_s \sim L_m = \frac{1}{2} \times 819 \frac{27}{67} \text{ muhūrtas} = 409 \frac{47}{67} \text{ muhūrtas}$

Finally, we present the heights of other celestial objects, as described in Tiloy Pannati (T.P.), in **Table IV** (Jain, 1958).

Table IV

| Height of Celestial Objects in Yojans | | | |
|---------------------------------------|-------------------------|--------------------|-----------------------|
| Celestial Object | Height in Yojans (Y) | Modern Units | |
| | | (AU) | km |
| Stars (Milky-way) | 790 | 1.7×10^9 | 2.55×10^{17} |
| Sun | 800 | 1.0 | 150000000 |
| Moon | 880 | 0.00257 | 384400 |
| Nakshtras (Orion stars) | 884 | 8.85×10^7 | 1.32×10^{16} |
| Mercury | 888 | 0.61 | 91691000 |
| Venus | 891 | 0.28 | 41400000 |
| Jupiter | 894 | 4.2 | 628730000 |
| Mars | 897 | 0.52 | 78340000 |
| Saturn | 900 | 8.52 | 1275000000 |

It may be noted from the above Table IV that according to Triloy Pannati distances of stars, Sun, and other planets from the earth vary between 700 and 900 *yojans* only, which is in contrast to measurements made by modern science, which are also mentioned in this table. This suggests major controversy/ anomaly between Jaina canonical literature and modern science. However, this controversy may be perhaps solved if we consider that height is measured in terms of weight of the celestial object relative to earth. Therefore, in order to obtain the true distance we have to multiply the height of the object with its relative weight ratio. For example, according to Table IV the Sun appears closer to Earth relative to Moon, which perhaps appears in context to the weight of the Sun is significantly higher than the Moon.

2.5 Units of distances during Indus Civilization (3000 BC):

In Mohen jodaro era (3000 B.C.), the size of the bricks all over the region was same. The length, breadth and width of bricks were always in the ratio of 4:2:1 and taken as standard. During Maurya Empire (400 BC), Chanakya (Kautilya) in his famous book “Arthashashtra” laid down the units of weights and measures and principles of enforcement i.e., legal metrology. In Arthashastra, Chanakya mentions two types of *dhanushas* as units for measuring lengths and distances. One is the ordinary dhanusha, consisting of 96 angulas, and the other dhanusha is mentioned as *garhpatya dhanusha* and consists of 108 angulas, used for measurement of roads and distances. Chanakya also mentions that a dhanurgraha consists of 4 angulas and a yojana consists of 8000 dhanushas. The smallest unit of length was parmanu. The elements of measurement system and definition of some of the units of length and their conversion is presented in **Table V**.

| <p style="text-align: center;">Table V</p> <p style="text-align: center;">Units of Length and Distances during Indus Civilization to Maurya Period</p> | |
|--|---|
| Sub-Units | Equal to |
| 8 parmanu | 1 rajahkan (dust particle coming from the wheel of a chariot) |
| 8 rajahkan | 1 liksha (egg of lice) |
| 8 liksha | 1 yookamadhya |
| 8 yookamadhya | 1 yavamadhya |
| 8 yavamadhya | 1 angula (approximate width of a finger) (2 cm=0.787402 inch) |
| 8 angula | 1 dhanurmushti =16 cm = 6.299 inch |
| 4 angula | 1 dhanugraha= 8 cm= 3.14961 inch |
| 12 angula | 1 vitasti = 24 cm = 9.44882 inch |
| 2 vitasti | 1 aratni or hast (or haath) = 48cm = 18.8976 inch |
| 4 aratni (haath) | 1 dand or dhanush =192 cm = 6.299 feet |
| 10 dand | 1 rajju = 19.2 meter = 62.9921 feet |

| | |
|------------------|--|
| 2 rajju | 1 paridesh = 125.98 feet |
| 2000 dhanush | 1 krosh = 4199.475 yard = 3840 meter \approx 3.84 km |
| 4 krosh (goruta) | 1 yojan \approx 9 miles \approx 15 km (approx) |

It may be noted that the units during Indus Civilization to almost Maurya period were very close to Jaina evolution period (10000 – 3000 BC), in their names and to some extent magnitude. This suggests that, by and large, units were derived from Jaina canonical texts. However, it is important to mention that the Yojana mentioned in Table V appears to be *atma yojan* of Jaina system (cf. section 2.3) considering *Tiloyapannatti* (TP). Further, it is very important to mention that the *Rajju* (=10 Dand or =19.2 meter) listed in Table V is not the same Rajju that described in Jainism, which is a unit of cosmic length. The Jaina *Rajju* is equal to $\sim 10^{23}$ km (cf. section 4.2 and 4.3). So we may conclude that Indus-Maurya Rajju is for local land measurement (Pradeshi Rajju).

2.6 Measurement of Length and Land during Mughal period (1526-1837 AD):

The Mughal measurement system measured length and land in terms of *gaz* and *beegha* with the following relationship as presented in Table VI.

Table VI
Units of measurement during Mughal period

| Sub-Units | Equal to |
|-----------|-----------------------------|
| 1 girah | width of 3 fingers (Angula) |
| 1 haath | 8 girah |
| 1 gaz | 2 haath |
| 1kathi | 55/6 haath |
| 1pand | 20 kathi |
| 1 beegha | 20 pand |
| 1 beegha | 20 vishwa |
| 1 viswah | 20 viswansah |

The *gaz* was widely used till the introduction of the metric system in India in 1956. Earlier in June 1864, the government of India recommended inch, foot, yard and mile for linear measurement and acre for area measurement with their conversion are given as 1 mile= 8 furlongs, and other as follows.

1 mile = 1760 yards = 1.61 km, and 1 furlong = 220 yards
Further, 1 acre = 4840 sq. yards, and 1 sq. mile = 640 acres.

The adoption of these linear measures makes the Indian system completely dependent upon the British system. A committee appointed on 10th Oct. 1913 again recommended a system based on the combination of Indian & British systems. In 1950, mile and furlong were common markers on road in India. The minimum unit of length was one inch (=2.54 cm).

After independence, it was realized that for fast industrial growth of the country, it would be necessary to establish a modern measurement system in the country. The Parliament (Lok Sabha) in April 1955 resolved: “This house is of the opinion that the Government of India should take necessary steps to introduce uniform weights and measures throughout the country based on metric system”.

The Central Act of 1956 called weights and measure Act 1956 enabled Government of India to establish standards of weight and measures system to introduce metric system. The metric system is an internationally agreed decimal system of measurement. In metric system multiples and submultiples of unit follow a decimal pattern. Length is now defined in terms of the speed of light, assumed to be an exact value (299,792,458 m/s).

The standard unit of length in metric system is the meter. To introduce the metric system in India the government established National Physical Laboratory (NPL) as the measurement standards laboratory. The standards maintained at NPL are periodically compared with standards maintained at other National Metrological Institutes in the world as well as the BIPM in Paris. This exercise ensures that Indian national standards are equivalent to those of the rest of the world.

The standard unit of length, meter, is realized by employing stabilized Helium-Neon laser as a source of light. Its frequency is measured experimentally. From this value of frequency and the internationally accepted value of the speed of light (299,792,458 meters/second), the wavelength is determined using the relation: Wavelength (λ) = Velocity of light (v) / frequency (ν). The nominal value of wavelength, employed at NPL is 633 nanometer. By a sophisticated instrument, known as an optical interferometer, any length can be measured in terms of the wavelength of laser light. The present level of uncertainty attained at NPL in length measurements is $\pm 3 \times 10^{-9}$. However in most measurements, an uncertainty of $\pm 1 \times 10^{-6}$ is adequate.

2.7 Units of Distances Measured in Modern Astronomy

Dealing with the numbers involved with the distances to the stars or even with those found in the solar system can be hard going. Astronomers make their lives easier by using a number of rulers (units of distance) for the distances and although they have some strange names they can be very useful for comparing the distances to stars, other galaxies and even the planets in our solar system.

AU (astronomical units):

The average distance between the Earth and the Sun is called one Astronomical Unit (AU). AU is the most commonly used for the distances of objects within our solar system. Pluto, previously known as the last planet in the solar system is found at an average distance of 39.47 AU from the Sun. Sedna the new body nearly as large as a planet found beyond Pluto is at ~ 76AU when near to the Sun and then goes to 880AU from the Sun in its giant elliptical orbit.

Light Years

Another most common unit in the astronomy is the light year. The light year is the distance that light travel in one year (365.25 days). It is most commonly used for the distances to stars and other galaxies. The nearest star is 4.2 light years away from our Sun. We are just 8.3 light minutes away from our Sun. The distance to the Pluto is about 13 light hours.

Some other interesting distances in light years are given in **Table VII**:

Table VII

Distances of Celestial objects in Light Years

| Object | Distance in light years |
|---|-------------------------|
| Nearest Star (Proxima Centuri) | 4.2 |
| Sirius the dog star (the brightest star in the sky) | 8.6 |
| Centre of the galaxy | approximately 30 000 |
| Andromeda (one of our nearest neighboring galaxies) | approximately 2 million |
| The stars of Orion. (Betelgeuse and Rigel) | 1400 light years |

Parsec (pc)

Astronomers started measuring distances from the amount that a star moves as the Earth goes from one side of the Sun to the other. Try moving your head and you will see that the position of everything around you changes. One parsec is derived from the smallest angle measurement of 1/3,600th of a degree or an arc second that is the angle that a star at this distance would appear to move in 6 months as the Earth journeys around the Sun. A parsec is 3.2616 light years or 30,857,000,000,000 km. Two parsecs is 6.5532 light years or twice the distance, it is not a

measure of change in angles of the stars. Due to the massive distance in the universe astronomers often use multiples of parsec commonly found are kilo-parsec (kpc) a 1000 parsecs or a mega-parsec (Mpc) 1,000,000 parsecs.

We present below in **Table VIII** a conversion ruler for some useful astronomical distance units.

Table VIII

Conversion Table of astronomical units

| | kilometres (km) | Astronomical units (AU) | Light Years (l.y.) | Parsec (pc) |
|-------------------------|-------------------|-------------------------|--------------------|--------------------|
| kilometres (km) | 1 | 149.6 million | 9,460,000,000,000 | 30,857,000,000,000 |
| Astronomical units (AU) | 0.0000000067 | 1 | 63,240 | 206,263 |
| Light Years (l.y.) | 0.00000000000011 | 0.000016 | 1 | 3.2616 |
| Parsec (pc) | 0.000000000000033 | 0.0000048 | 0.3066 | 1 |

3. Units of Time:

3.1 Historical Perspectives:

It has been quite natural that ancient people might have felt need for measurement of equal intervals of time. The ancient Sumerians divided the day in three unequal watches down to medieval time (Sarton, 1927). The ancient Babylonians divided the day (day and night) into 12 hours of 30 *gesh* each, where *gesh* is equal to 4 min of current time. On the contrary, the Egyptians had divided the day and night into 12 hours each. Later in medieval time the day of 24 hours was adopted. However, in ancient India the day, period between sunrise and sunset, used to be divided into 2, 3, 4, 5 and 15 parts. We find reference in **Atharvaveda Jyotisha (AJ)** that day and night each was further split up into 15 equal parts known as *Muhūrtas*. Such a 30-fold division of an *ahorātra* (day and night) must have impregnated the primordial concept of a standard *muhūrta* (~48 min) which no longer denoted a different length of time on different days. Thus the need for corroborating the physical concept of standard *muhūrta* as the unit of time might have necessitated the usage of devices like gnomon, water clocks *etc.* One such

experiment has been described in AJ citing text of gnomonic (shadow lengths) devise to standardize the *muhūrta* as 1/15 part of an Equinoctial day. The names given to these total thirty (day and night) *muhūrtas* are as follows.

Raudra; Sveta; Mitra; Vayu; Suvita; Abhicandra; Mahendra; Balawana; Brahma; Bahusatya; Isana; Tvasta; Bhavitatma; Vaisramana; Varuna; Visvasena; Prajapatya; Upasama; Gandharva; Agnivesa; Satavrsabha; Atmava; Amama; Kranavama; Bhauma; Vrasabha; Raksasa

There had been, however, much diversity of the relation between *Muhūrtas* and other sub-multiple units of time. In this context Vedāṅga Jyotiṣa (VJ) quotes Sutra (verse) as follows.

**“A 10.05 Kalas make one Nadika; two Nadikas make one Muhūrta, and
30 Muhūrtas or 603 Kalas make one complete day”**

The above *sūtra* is summarized in **Table IX** presenting time units given in VJ.

Table IX
Conversion of Units of Time in Vedāṅga Jyotiṣa (VJ)

| Sub units | Equals to |
|-------------|----------------------------|
| 10.05 Kālas | 1 nādika |
| 2 nādikas | 1 muhūrta |
| 30 muhūrtas | 1 ahorātra (day and night) |

On the other hand Atharveda Jyotiṣa (AJ) defines time with better resolution as presented in **Table X**.

Table X
Conversion of Units of Time in Atharveda Jyotiṣa (AJ)

| Sub units | Equals to |
|-------------------------------|----------------------------|
| 12 nimeṣas (blinking of eyes) | 1 lava |
| 30 lavas | 1 kala |
| 30 Kālas | 1 truti |
| 30 trutis | 1 muhūrta |
| 30 muhūrtas | 1 ahoratra (day and night) |

According to **Dr. L. Sibaiya** (Sibaiya, 1973) one *nimeṣa* is equal to 27/125 seconds of modern science. On the other hand Table X enables us to estimate a different value of *nimeṣa* to second conversion as follows.

1 muhūrta = 324,000 nimeṣas (Table X)

1 muhūrta = 48 minutes = 2880 seconds

Thus,

324000 nimeṣas = 2880 seconds

And hence, 1 nimeṣa = 2880/324000 seconds
= 0.0088888889 seconds
= 8.88 milliseconds

However, we find that there was a lot of discrepancy and diversity in sub units of time in general and in *nimeṣa*, *trutis*, *lava* etc. in particular during Vedic era. Though we do not consider detailed discussion on other forms of units of time but briefly we would like to present Vedic sub-multiple units of time particularly sub-units of *nimeṣa* as shown in **Table XI**.

Table XI

| Sub-units of <i>Nimeṣa</i> in Vedic Era | |
|---|-------------|
| Sub units | Equals to |
| 2 parmānus | 1 aṇu |
| 3 aṇu | 1 trasareṇu |
| 3 trasareṇus | 1 truti |
| 100 trutis | 1 vedha |
| 3 vedhas | 1 lava |
| 3 lavas | 1 nimeṣa |

It may be noted from Table XI that

1 *nimeṣa* = 16200 *parmānus*

This gives 1 *parmāṇukāla (atomic time)* = $\frac{0.0088}{16200}$ seconds = 543 nano sec.

3.2 Unit of Time: Jaina System:

It is only Jainism which defines time in two separate entities viz. *Nischaya kala* and *Vyavahara kala*. We briefly define these two times (kalas) and do not consider detail description in this article. The microscopic to macroscopic time scale in Jaina units are by and large *Vyavahara kala*, which enables us to measure the modification, variation or change of a substance in a given period such as *samaya*, *avalika*, *ghadi etc.* (in Jaina) and seconds, minutes, days *etc* (in modern science). On the contrary, the time representing absolute characteristic of a given substance is *Nischaya kala* such as onset of Big Bang, onset of Earth's rotation, revolution *etc.*

Thus, if we represent absolute time (*Nischaya kala*) of a given substance as T_0 then relative time (*Vyavahara kala*) for the same substance will be the time elapsing from T_0 taken for the change/ modification or transform spatial/ structural form of the substance (energy transfer). For example, time of the big bang *i. e.* explosion of the cosmic egg was absolute time but later time taken for the formation of the fundamental particles, celestial objects, solar system and evolution of the Sun, earth and planets *etc.*, are relative to the big bang (absolute) time. Similarly, after the formation of the earth (absolute time for the earth), we consider its various motions to measure days, months *etc.* We also know that each event is associated with change in energy in space as a function of time, which is *Vyavahara kala*. Therefore the *Vyavahara kala* is related to transfer of energy/ momentum in space and time, which, perhaps, was the origin of thought for general theory of relativity proposed by Einstein (1915). Thus the *Vyavahara kala* is a function of energy transfer in 3D relative to absolute time and can be written by following function. This mathematical definition was given by Jain and Jain (2017), for the first time, and thus discussions and criticisms are welcome.

$$T_r = f(E_{x,y,z}, T_0) \quad (4)$$

We review the units described in Jaina for both *Vyavahara kala* and *Nischaya kala* in contrast to other system of units. By definition *parmāṇukāla* is an atom of time (literally). According to Mimansakas *parmāṇukāla* is defined as the time taken by an atom to cross a distance of its own size (diameter). The size of the atom, however, underwent to change from time to time because atoms are different for different elements. And therefore this concept was not acceptable by Jaina. According to Jaina's concept, an electron, a fundamental particle of modern atom, is infinitely more gross (same for all elements) than a *parmāṇu* (Zaveri, 1975). Jaina suggested that *parmāṇukāla* in a broader sense, denoted the smallest interval of time, represents different length of time at different times in accordance of atoms type and space.

In the above context, Jaina came out with different concept, and according to Jaina canonical texts the "*samaya*" (time literally) is the smallest indivisible part of time (Ram, 1931). "*Samaya*", a unit of time is related with other Jaina units of time as shown in **Table XII**.

Table XII

| The <i>Jaina</i> units of time | |
|---------------------------------------|----------------------------|
| Sub units | Equals to |
| The Smallest part of time | 1 samaya |
| Jaghanya-yukta asankhyat samayas | 1 avalika |
| $4446 \frac{2458}{3773}$ avalikas | 1 prana (breath) |
| 7 pranas | 1 stoka |
| 7 stokas | 1 lava |
| 38.5 lavas | 1 ghati |
| 2 ghatis | 1 muhūrta |
| 30 muhūrtas | 1 ahoratra (day and night) |
| 30 ahoratras | 1 masa (month) |
| 12 masas | 1 varsa (year) |

Table XII enables us to compute easily the *muhūrta* in terms of *avalikas* but not in terms of *samayas* as follows.

$$1 \text{ muhūrta} = 16777216 \text{ avalikas}$$

This gives **1 second = 5825.422 avalikas**

In order to estimate the mahurta in terms of samayas, Jaina canon (Sharma, 1972) classifies counting of numbers in following three categories.

First order number categories:

1. Sankhyat (measurable);
2. Asankhyat (non-measurable but not infinite);
3. Ananta (infinite)

Each above category has been further divided into three sub-categories as follows.

Second order categories.

1. Parita
2. Yukta
3. Asankhyata

The second order category has been furthermore split up into three more sub-categories as follows.

Third order categories:

1. Jaghanya (maximum, highest)
2. Madhyama (middle, in-between)
3. Utkresta (minimum, lowest)

As it may be noted that the above sub categories by and large are qualitatively based and not defined precisely quantitatively like others specified in Tables XII. However, according to Ram (1931) Jaghanya-yukta-asankhyata (=J) samayas make one avalika, Muni Mahendra Kumar II (Lishk, 1980) computed the least value of J approximately to be

$$(7.58 \times 10^{193})^{(7.58 \times 10^{193})} \quad (5)$$

Now we know from above that 1 muhūrta = 16777216 avalikas, which enables us to estimate the samaya as follows.

$$1 \text{ samaya} = \frac{48 \times 60}{16777216 \times (7.58 \times 10^{193})^{(7.58 \times 10^{193})}} \text{ sec onds} \quad (6)$$

$$= 1.764 \times 10^{-1.469 \times 10^{192}} \text{ sec onds} \quad (7)$$

However, we are not convinced on the calculation of J from qualitative statements and hence the final estimated value of *samaya* may not be correct. We do not recommend considering samaya's value for any further estimation/ calculation. Nevertheless, the above relation shows that *samaya* is extremely smaller than *parmāṇukāla*.

The other confusion in Jaina units is estimation of *avalikas* in a *muhūrta*. However, the fact that $4446 \frac{2458}{3773}$ avalikas make a *prana* (breath) suggests us to speculate that a *muhūrta* might have been equal to 3773 *pranas* (breaths) in a given one system and equal to 16777216 *avalikas* in other system of time units. When these two systems were intermingled, 3773 *pranas* were equated with 16777216 *avalikas*. Otherwise the division of a *prana* (breath) into $4446 \frac{2458}{3773}$ makes no sense, albeit inadequate, for the choice of this number.

Thus, it appears that *Jaina* philosophy, after Mahavira and Bhadrabahu period, proposed new system of units which is, perhaps, better than previous units. However, the least minimum unit *Samaya* could not be proposed in precise quantitative form and that led the whole unit

system in confusion. In this context we strongly feel that we must briefly include the time units described by Aryabhata (476 A. D) in his *Aryabhatiyam* (Sharma, 1975), which are better comparable with present time units as may be noted from **Table XIII**.

Table XIII

| Time Units in Aryabhatiyam | |
|-----------------------------------|------------------------------|
| Sub units | Equals to |
| Time taken to Pronounce | |
| 60 Guru Aksaras (letters) | = 1 Vinadika (24 seconds) |
| 60 Vinadikas | = 1 Nadika (24 minutes) |
| 60 Nadikas | = 1 Ahoratra (day and night) |

The Aryabhatiyam Saidhantik system of 60-fold divisions of each unit was well established and employed more frequently. Further, it is close to current modern time units which also has 60-fold divisions system and thus better comparable with modern units. However, the least unit in Aryabhatiyam is time taken to pronounce one guru *aksara* i. e. $24/60 = 0.4$ second = 400 milliseconds.

On the other hand, Jaina system of time units could have been better but Jaina had conceived two Suns, each describing half the “*diurnal circle*” in an ahoratra (day and night) or thirty muhūrtas, to describe the complete diurnal circle. Otherwise, therefore, the Sun would take 60 muhūrtas to describe the complete diurnal cycle. However, in context to modern astronomy, now we know that it is only one Sun that describes the complete diurnal circle in 30 muhūrtas. Nevertheless, the Sexagesimal system of 60-fold division of each unit of time was developed, which, however, is considered to be developed by Sumerians (original dwellers of Babylon) and their successors in Mesopotamia (Bernal, 1954).

So far we discussed units of time from **microscopic scale** (sub-second) to muhūrta and ahoratra. However, Jaina also regarded Kala (time) as ever turning wheel with neither beginning nor end, which enabled Jaina to define **macroscopic time scales**. The macroscopic time cycle (kala chakra) has two sub-divisions of time viz. *Avasarpani kala* and *Utsarpani kala* corresponding to descending and ascending phase of time cycle respectively. Each kala elapses a total period of 4,62,000 years, which has been further split up into six sub-divisions known as *Aara* viz. Suṣama-suṣamā; Suṣamā: Suṣama-duḥṣamā; Duḥṣama-suṣamā; Duḥṣama: Duḥṣama-duḥṣam. The period of each sub-division (*aara*) is shown in **Table XIV**, while the cyclic form of

avsarpani (descending) kala and utsarpani (ascending) kala, widely known as *Jain Cosmic Cycle of Time*, is presented in **Figure 4**.

Table XIV
Macroscopic time scales (Kala Chakra) in Jaina

| S. No | Phase (Aara) | Equals to Years |
|-------|-----------------|--|
| 1. | Suṣama-suṣamā | 400 trillion sāgaropamas (168000 years) 10^{10} Sagaropamas=4.2 years (Jain, 2014) |
| 2. | Suṣamā | 300 trillion sāgaropamas (126000 years) |
| 3. | Suṣama-duḥṣamā | 200 trillion sāgaropamas (84000 years) |
| 4. | Duḥṣama-suṣamā | 100 trillion sāgaropamas (42000 years) |
| 5. | Duḥṣama | 50 trillion sāgaropamas (21000 Years) |
| 6. | Duḥṣamā-duḥṣamā | 50 trillion sāgaropamas (21000 Years) |
| | | Total period: 462000 years |

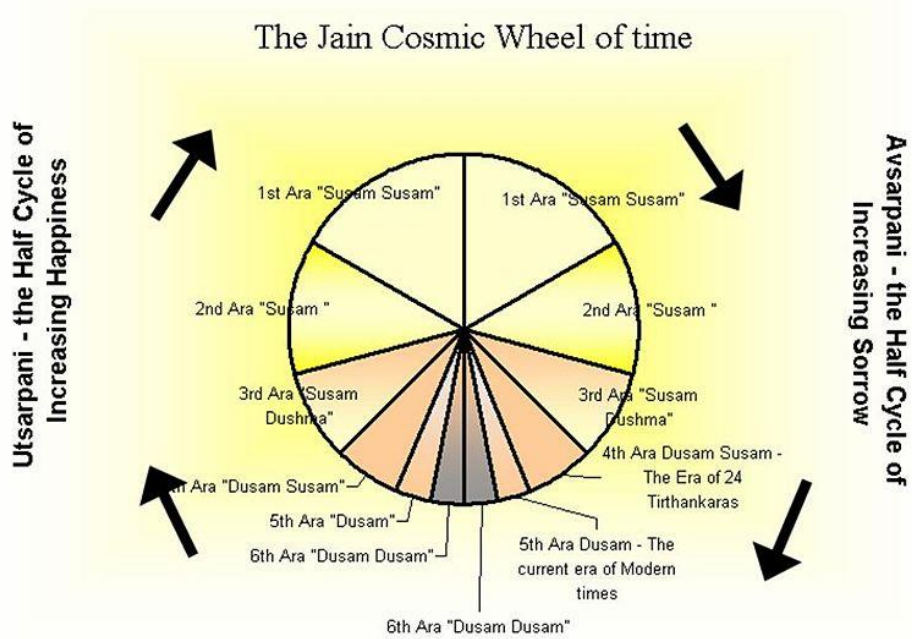


Figure 4: Jain cosmic wheel of time (kala chakra). Each *Aara* is shown during *avasarpani* (descending) and *utsarpani* (ascending) kala.

Thus complete Jain cosmic cycle (kala chakra) is of about 9,24,000 years. Jain (2014) showed that period (**T**) from Duḥṣamā-duḥṣamā (21000 years) to next Aara varies as multiple of n where n is an integer =1, 2, 4, 6, 8. For example, $n=1$ leads to estimate period of the next Aara Duḥṣamā $T= 1 \times 21000 = 21000$, and $n=2$ leads period of next Aara Duḥṣamā-suṣamā to be $= 2 \times 21000 = 42000$ years. Similarly, $n=8$ leads period of first Aara Suṣama-suṣamā to be $T=8 \times 21000 = 168000$ years.

However, we wish to mention that the period 462000 years, period for Avasarpani and Utsarpani, is *vyavhara kala* and not absolute time (Jain, 2015), most likely relative to temperature and atmospheric change on the Earth as described earlier by Jain (2012), and discussed below with reference to modern science.

We do not discuss socio-economic-culture during each Ara of avsarpani and utsarpani Kala, however, we compare Jain Kala Chakra with climate cycle on the Earth and attempt to investigate asymptotic correlation between Jaina and Earth time cycles. In **Figure 5** we show variation of normal global air temperature (15^0 C); CO₂ and dust concentration over the time scale of thousands of years ago from present as derived from the radioactivity tests over the sediment sample brought from Vostok site in Antarctica (Jain, 2012). It may be noted that temperature shift and CO₂ emission vary in synchronization, while the dust concentration vary inversely to them as a function of time. It may be further noted that after every 100,000 years CO₂ emission and hence the temperature falls to minimum causing period of long term glacier over the Earth known as Large Glacier Maximum (LGM). Moreover, dust concentration varying inversely does not allow solar radiation to fall on the Earth, which further reduces temperature on the Earth. Thus period of LGM of severe cold of about few thousands of years do not permit nurturing of human civilization, however, life in some form of bacteria/ virus may exist inside the ice-sheets. The period of ~100,000 (~1 lakh) years has short ascending (~25000 years) and long descending (~75000 years) phase, which, however, do not match with proposed utsarpani and avasarpani periods in Jaina Kala Chakra. Nevertheless, when we see over the longer period of > 4,50,000 years (*cf.* **Figure 5**), comparable to one phase of Kala Chakra (4,62,000 years), we find several small or longer pulses of time which may match with Aaras. We note that extensive investigation between Earth's climate cycle and Jaina kala chakra may reveal better understanding on their relationship. However, we do not consider detailed description in this article because it is not relevant to theme of the article. Nevertheless, we show in Figure 5, the period of Tirthankar Rishabhdeva, Munisuvratnath, Mahavira and Lord Rama with reference to calculations made from Kaal Chakra (*cf.* Figure 4) and climate cycle. On the other hand, it has been well established and widely accepted that period from 850 to 630 Million year before present (B. P.) was most severe Ice Age in the Earth's history, which, however, has not been mentioned in any Jaina literature.

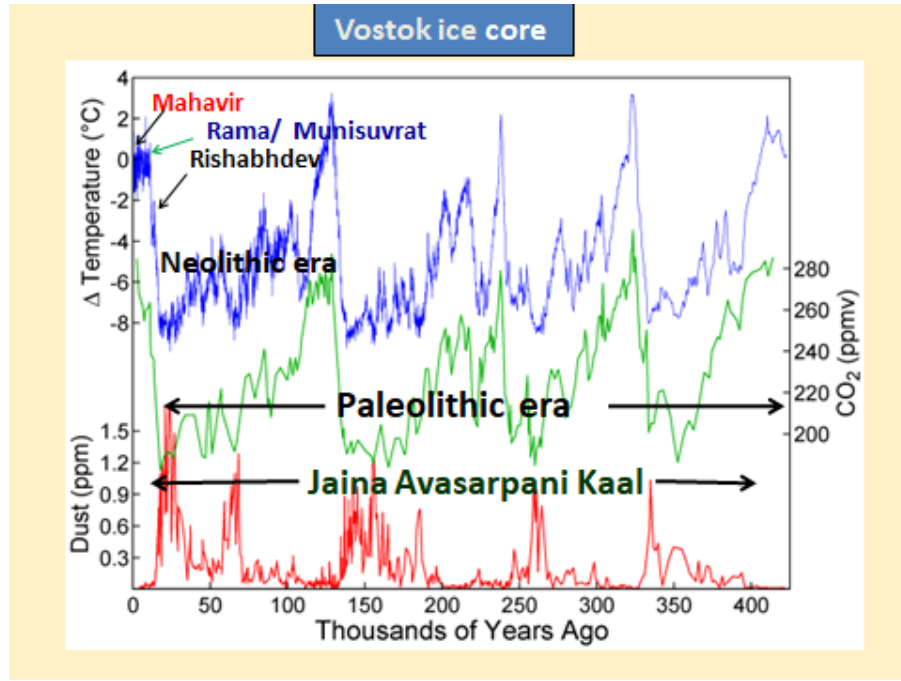


Figure 5: Variation of normal global air temperature (15⁰ C - blue); CO₂ concentration (green) and dust concentration (red) over the time scale of thousands of years ago from present. The periodicities of 100000, 42000, and 10000 years are associated with eccentricity, obliquity, and precession motion of the earth, while small periods of 11, 22, 80, 200 and 400 years are associated with sunspot cycle (Jain, 2012). Comparing periods of Aara in Awsarpani kaal (cf. Figure 4) with this climate cycle, periods of Tirthankar Rishabhdev, Munisuvratnath and Mahavir and Lord Ram are shown by arrow on the plot.

Further, Jain (2012, 2017) also estimated cosmic time scale generally misinterpreted and described in Jain canonical texts. For example, period of Bhagwan Rishabh Dev is given in Jain texts as *koda-kodi*, interpreting crore multiplied with crore *i.e.*, 10¹⁴ years, before the birth of the Earth according to modern cosmology, which is, however, unlikely event. But, on the other hand, according to Jainism the universe is not born, rather it existed in the past as it is in the present form and will continue in future, and therefore birth of Tirthankar Rishabhdev might be a possible event before 10¹⁴ years. However, in view of the description of history of Shri Rishabhdeva, and the new adventures works done by him as well as the socio-economic-cultural revolution brought by him, for example *Aasi*, *Maasi* and *Krishi*, Rajmal Jain (2012) suggests his period to be late Neolithic era, around 10000 years before present (cf. Figure 5). Accordingly, Rajmal Jain (2012, 2017) explained *koda* and *kodi* do not mean crore rather they represent simply magnitude as follows.

$$Koda = 1000; Kode = 100; Kodi = 10$$

This suggests that the period of Bhagwan Rishabh Dev is likely to be 10,000 units of time (years).

It has to be noted that the relationship on time scale between Jaina and modern science is asymptotic and exact nature has to be understood in greater detail through fundamental research. On the other hand it also has to be understood and investigated whether Jaina Cosmic time scale is functioning over local regions or at global scale *i. e.* over the whole earth. There are views that Jaina Kala chakra operates over *Adhai Dweep* only and not over each continent of the earth. Therefore above findings and asymptotic relationship between Jaina and modern science appears to be of concern on one side but becomes of great interest to probe it further.

It is further to be noted in context to recent research and development carried out by Neppe and Close (2015) and Close and Neppe (2018) that the triad of Space, Time and Consciousness (STC) are always tethered together and form a reality unit. They are never separated. They have developed a model known as “The Triadic Dimensional-Distinction Vortical Paradigm” (TDVP), which is a metaparadigmatic model based on the available broader empirical data of all the sciences (physical, biological, consciousness and psychological), validated partly by mathematical theorems, applying LFAF for scientific validation, and applied to philosophy (as “Unified Monism”). The key features are STC tethering, 10+ Dimensions, broader “Consciousness”, Infinity, plus a model of life and order. In TDVP, reality is a unit. This single indivisible unit of Reality always exists in everything. It has an infinite component ("infinite sub-reality") and a finite component ("finite sub-reality"). The finite is entirely embedded in the infinite which makes up that single unit of Reality. We feel that fundamental basis of TDVP is same as the core concept of Jainism and thus it is very interesting to investigate the reality in context to TDVP and Jainism as currently being carried out by Pokharna et al., (2019).

4. Universe in Hindu, Jain and Modern Cosmological models:

4.1 Hindu Cosmology:

In *Hindu cosmology*, the universe is cyclically created and destroyed (Dick Teresi. 2002). Hindu cosmology divides time into four epochs or *Yuga*, of which the current period is the *Kali yuga*. According to Sushil Mittal and Gene Thursby (2012) in the Hindu Vedic cosmology there is no absolute start to time as it is considered infinite and cyclic. The current universe is just the start of a present cycle preceded by an infinite number of universes and to be followed by another infinite number of universes (Andrew Zimmerman Jones, 2009).

The central aspect and dominant theme in Puranic Hindu cosmology is of cycles of creation and destruction of the universe and repetition of the same. It also says about multiple universes, each takes birth from chaos, grows, decays and dies into chaos, to be reborn again, which somehow close to findings in Big Bang theory of modern cosmology. Further, there are different and parallel realities. According to Chapman and Driver (2002) Brahma's one day equals 4.32 billion years which is a Kalpa. Each Kalpa is subdivided into four yuga (*chaturyuga*, also called *mahayuga*). These four yuga are: *krita* (or *satya*), *treta*, *dvapara* and *kali* yugas. The current time is stated to be one of *kali yuga*. The starting year, length of each, or the grand total, is not consistent in the Puranas.

One complete cycle of the four (Kṛta or Satya, Treta, Dvapara and Kali) Yugas is one Mahā-Yuga (4.32 million solar years) and is confirmed by the *Gītā Śloka 8.17 (statement)*

*"sahasra-yuga-paryantam ahar yad brahmaṇo viduḥ
rātrim yuga-sahasrāntām te 'ho-rātra-vido janāḥ",*

i.e a day of brahma is of 1000 Mahā-Yuga. Thus a day of Brahma, Kalpa, is of duration 4.32 billion solar years. Two Kalpas constitute 24 hours (day and Night) of Brahma. A Manvantara, which consists of 71 Mahā-Yuga (306,720,000 solar years) is ruled by a Manu. After each Manvantara follows one Sandhi Kāla, of the same duration as a Kṛta Yuga (1,728,000 Solar Years). It is said that during a Sandhi Kāla, the entire earth is submerged in water. According to Hindu scriptures, the world would be destroyed at the end of the Kali yuga.

According to “The Power of Stars” by Bryan Penprase (2017) and “Tracing The Way: Spiritual Dimensions of the World Religions” by Kng Hans (2006) as well as to *Srimad Bhagavatam 3.11.19*, which most scholars agree was composed around Mahabharat war (3000 to 3100 BC), the Yugas are much longer. In fact they have been mentioned in *divine year (deva year)* in which one day is equal to one human year, thus the length of each Yuga is measured in *deva years*, where one deva year is equal to 360 *human years*. Further, the number 1200 deva years is minimum concept length of the Kali Yuga, and therefore its total length is $1200 \times 360 = 432000$ human years. Interestingly, the length of other Yugas goes in multiple of 1200 deva years. This allows us to estimate the length of Dwapara Yuga: $2400 \times 360 = 864,000$ human years; Treta Yuga: $3600 \times 360 = 1296000$ and that of Satya (Keta) Yuga equals to $4800 \times 360 = 1728000$ human years.

In conclusion, the Hindu cosmological model says that the universe in space is vast, infinite and composed of multi-verse., and on time scale it goes on creation and end periodically, however with undefined absolute time of start of its creation. The concept of creation and destruction corresponds qualitatively with big bang theory of modern cosmological model. Further, the concept of multiverse universe is also being recently talked in modern astronomy. However, on the other hand, on time scale, one day of Brahma (Kalpa) 4.32 billion years appears to be the formation of the Sun and solar system (4.6 billion years according to estimation of modern science). However, the period of big bang proposed in the modern astronomy is about 13.7 billion years ago, which does not match with two kalpas (day and night of Brahma) corresponding to 8.64 billion years.

4.2 Jain Cosmology:

On the other hand, Jainism subscribes to *Steady State theory* (Bondi and Gold, 1948; Hoyle et al., 1995), in which the universe is eternal, without beginning and end. The Jain scriptures have discussed constituents, structure, size and time cycles (*Kal Chakra*) operative in the universe in great detail. Jainism divides the universe into two parts - *Loka* and *Aloka*. *Loka*, the visible part of the universe, is finite, defined by the existence of the six basic constituents, *jiva* (soul),

pudgal (matter), *akash* (space), *kaal* (time), *dharmastikaya* (considered to be responsible for motion) and *adharmastikaya* (responsible for state of rest) and is immersed in the infinite *Aloka*. The Jainism cosmology theory, to some extent, is close to the steady state cosmology model of Hoyle, Bondi, and Narlikar (1995). However, Hubble's observation of expanding universe contradicted it, and thereby they tried to accommodate the Big Bang event in the Steady State model and modified it to a "Quasi Steady State" theory, in which the universe is oscillating between contraction and expansion.

The central aspect of Jain cosmology is that it considers consciousness (*atma*) as an integral part of the universe in addition to space and time. It is interesting to note that Jainism believes that the whole universe is finite on spatial scale and is full of life of various physical scales. The finite universe (*lokakash*) is better quantitatively described and proposed that it has 12 dimensions: 3 each space, time and consciousness (soul/ life is everywhere in the universe) and 3 connecting vertically (vortex) to Dev loka, Madhya loka and Adho loka. We may say that these three lokas are working in parallel to each other. The shape of Jain cosmos is described below.

In Jain astronomical system the universe (*lokakash*) is represented as shown in **Figure 6**, which has three sections on the vertical dimension referred as: Devloka; Madhyaloka and Adholoka. Devloka refers to place of demi-gods and heavenly beings. The Dev loka has a height of 7 *Rajjus* (unit of cosmic height). It consists of 8 regions, each region represents one type of heaven, (called Deva Loka), abode of Empyrean celestial-beings. Madhya loka refers to the place for human and animals and Adho loka (*Naraka*) the place for hellish beings. The Middle loka is located around the mountain Meru. Innumerable pairs of circular land-water masses exist in the Middle Loka. Its innermost circular land mass, termed *Jambu dwīpa*, is surrounded by a circular ring of saline ocean (*Lavaña Samudra*). *Manushya Loka*, where humans reside, is part of Middle loka. The Lower- Loka consists of 7 regions, a type of land, called Hell, abode of Empyrean infernal beings. Further, a region of absolute purity, *Siddh Sheela*, exists above the Dev Loka. It is the eternal abode of Siddhas. When a soul attains enlightenment, it moves to this land of purity.

Outside the *lokakash* (universe) is the *Alokakash*, which is infinite but empty without any matter and energy. The vertical dimension (height) of the whole universe is proposed as 14 *Rajju*, while the breadth/ width and depth at various locations has been described in great details by Jain et al. (2017) and by many other authors in the monograph "Scientific perspectives of Jainism" published by Jain Vishwa Bharti Institute, Ladnun.

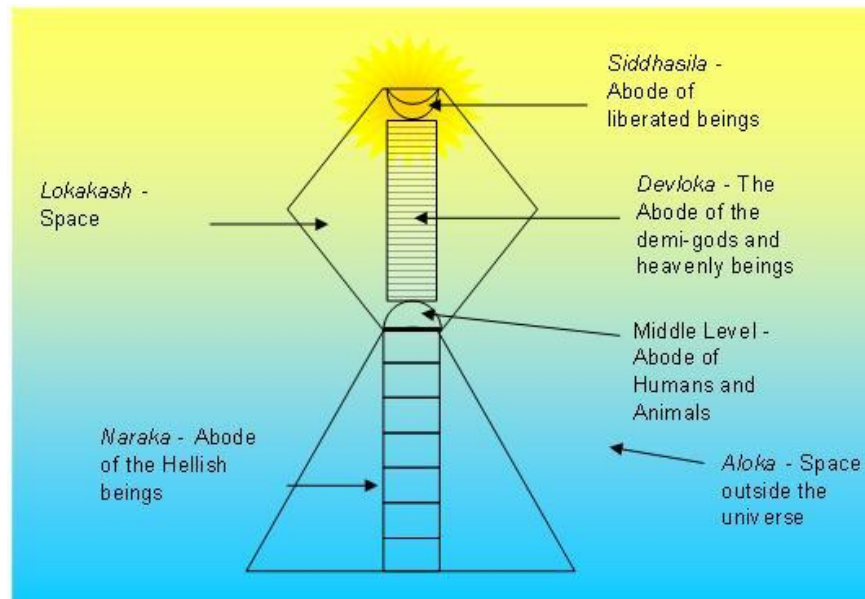


Figure 6: Schematic cartoon representing three sections of the vertical Jain cosmological model.

In conclusion the Jain cosmology is more close to modern science in some aspects but in contradiction to theory of evolution such as Big Bang. Jainism believes in steady state theory with various motions, modifications, and expansion of the universe etc. take place within the system under the law of nature. In fact the fundamental core concept of basic elements of universe: space, time and consciousness with 12 dimensions make the Jain cosmology different over modern cosmology. However, recently many scientists have started considering consciousness as an integral component of the universe in addition to space and time, and they are tied up with each other to form a reality of the universe (Neppe and Close (2015) and Pokharna et al. (2019).

4.3 Modern Cosmology:

In the modern cosmology there are many models for the evolution of the universe viz. Steady State, Big Bang, String theory etc. In the steady state model, the density of matter in the expanding universe remains unchanged due to a continuous creation of matter, thus adhering to the perfect cosmological principle, a principle that asserts that the observable universe is basically the same at any time as well as at any place. This model is close to Jainism (*cf.* section 4.2). However, this model is now rejected by the vast majority of cosmologists, astrophysicists and astronomers, as the observational evidence points to a hot Big Bang cosmology with a finite age of the universe, which the steady state model does not predict. However, a first order approximation of the **observable universe** consists of the galaxies and other matter that can, in principle, be observed from Earth at the present time because light and other signals from these objects has had time to reach the Earth since the beginning of the cosmological expansion. Assuming the universe is isotropic, the distance to the edge of the observable universe is roughly the same in every direction. That is, the observable universe is a spherical volume (a ball)

centered on the observer (**Figure 7**). Every location in the Universe has its own observable universe, which may or may not overlap with the one centered on Earth.

The best estimate of the age of the universe in most recent time as of 2013 is 13.798 ± 0.037 billion light years but due to the expansion of space humans are observing objects that were originally much closer but are now considerably farther away (as defined in terms of cosmological proper distance, which is asymptotically equal to the distance at the present time) than a static 13.8 billion light years distance. It is estimated that the diameter of the observable universe is about 28 billion parsecs (93 billion light-years), putting the edge of the observable universe at about 46–47 billion light-years away.

Bars and Terning (2009) estimated that the diameter of the observable universe is about 28 gigaparsecs (93 billion light-years i.e 8.8×10^{26} meters). The commoving distance from Earth to the edge of the observable universe is about 14 gigaparsecs (46 billion light years or 4.3×10^{26} meters) in any direction. The observable universe is thus a sphere with a diameter of about 93 GLY or 8.8×10^{26} m (Jain, 2015). Assuming that space is roughly flat, this size corresponds to a commoving volume of about 4.1×10^5 GLY³ or 3.5×10^{80} m³. Jainism proposes a volume of about 343 cubic **Rajjus** of the canonical Jaina universe. Comparison of volumes of both systems enables us to estimate the Jaina unit **Rajju** to be about **1.0067 X10²³ kilometers or ~1.5 GLY**. However, the figures quoted above are distances at *present time* in cosmological time and not distances *at the time the light was emitted*. For example, the cosmic microwave background radiation that we see right now was emitted at the time of photon decoupling, estimated to have occurred about 380000 years after the Big Bang, which occurred around 13.8 billion years ago. This radiation was emitted by matter that has, in the intervening time, mostly condensed into galaxies, and those galaxies are now calculated to be about 46 billion light-years from us.

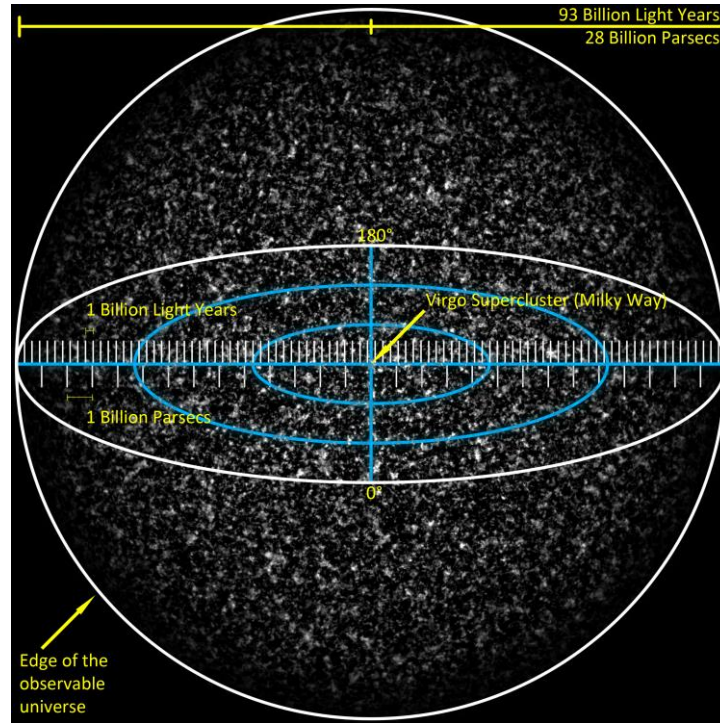


Figure 7: Visualization of the whole observable universe. The scale is such that the fine grains represent collections of large numbers of superclusters. The Virgo Supercluster – home of Milky Way – is marked at the center, but is too small to be seen.

In conclusion, the modern cosmological model currently has better confidence on Big Bang theory in which birth and collapse are assumed similar to Hindu cosmological model but time of the bang are not similar. On the contrary, steady state model is more close to Jain cosmological model where the expansion and other alterations, motions and explosions of the universe are considered as internal changes/ transformations within the visible universe. Readers are referred to read Jain et al. (2017).

5. Relationship between Space and Time Units in Jainism and Modern Science:

Currently modern science believes that mathematically, and in accordance with relativity, space and time are in some sense interchangeable. But, physicists do not know that whether they form co-equal parts or co-spatial-temporal of a larger 'thing' called space-time. However, on the other hand, we know that it is only within space-time that the most complete understanding of the motion and properties of natural objects and phenomena can be rigorously understood. Space and time are to space-time what arms and legs are to humans. In some sense they are interchangeable, but you cannot understand 10,000 years of human history without including both arms and legs as part of the basic human condition. Jain (2015) proposes that space and time when embedded in gravity may be considered as one phenomenon.

Earlier Einstein (1915) stated two postulates:

1. The speed of light (about 300,000,000 meters per second) is the same for all observers, whether or not they're moving.
2. Anyone moving at a constant speed should observe the same physical laws.

Putting these two ideas together, Einstein realized that space and time are relative - an object in motion actually experiences time at a slower rate than one at rest. Although this may seem absurd to us, we travel incredibly slow when compared to the speed of light, so we don't notice the hands on our watches ticking slower when we're running or traveling on an airplane. Scientists have actually proved this phenomenon by sending atomic clocks up with high-speed rocket ships. They returned to Earth slightly behind the clocks on the ground. Thus space of 3-dimensions and time as fourth dimension to be coupled to understand the travelling phenomena and called as space-time continuum.

Muni Mahendra Kumar (2010) has given an excellent description of relationship between time and space units as demonstrated in Jainism in his book on “Enigma of the Universe”. According to him Digambara tradition presents two equations which indicate relations between time-units and space-units. In these equations, \log_2 is used.

In the first equation, the relationship between *sūcī aṅgula* (a linear space-unit) and *addhā palyopama* (a unit of time) is described as follows: *sūcī aṅgula* is equal to *addhā palyopama* raised to the power logarithm to the base 2 (\log_2) *addhā palyopama*.

$$sūcī aṅgula = (addhāpalya)^{\log_2 addhāpalya} \quad (8)$$

Though the units of these two quantities have not been presented but as we are aware that the *sūcī aṅgula* is *pradeśa* and *addhā palyopama* is *samaya* because both of them are the units of measurement of space and time respectively. In this way, if *sūcīaṅgula* be x *pradeśa* and *addhāpalya* be 'p' *samaya*, then

$$x = p^{(\log_2 p)} \quad (9)$$

Second equation relates *jagaśreṇī* (the cosmic row of space units which measures seven *rajjus*) and *addhāpalya*. *Jagaśreṇī* is equal to *ghanāṅgula* (a three dimensional space-unit) raised to the power logarithm to the base two innumerable fraction of *addhāpalya*.

$$Jagaśreṇī = (ghanāṅgula) \frac{\log_2 addhāpalya}{innumerable} \quad (10)$$

Here, *ghanaṅgula* means cube of *sūcī aṅgula*, i.e., cube of the number of *pradeśas* of *sūcī aṅgula*.

If *Jagaśreṇī* = 'j' *pradeśa*, and innumerable = a, then

$$j = \left(x^3\right)^{\left(\frac{\log_2 p}{a}\right)} \quad (11)$$

Joining both the equations, we get:

$$j = p^{\left(\frac{(\log_2 p)(3\log_2 p)}{a}\right)}$$

$$j = p^{\left\{\frac{3(\log_2 p)^2}{a}\right\}} \quad (12)$$

Thus according to Jain system of units too space and time are correlated, however, exact nature of correlation in context to modern units to be understood. This is an important topic for future investigation. Such investigation should include on one side the space and time embedded in gravity and other side both times (Nischayakala and Vyavharakala) described in Jainism as well as considering 12 dimensional universe.

6. Conclusion:

I have been writing a series of research articles on “**Discovery of Lost**” in the history. Earlier, in 2017, I wrote an article on the Lost “*Ashtapad Mahatirth Palace Temple*” constructed by King Bharat Chakravarty to commemorate salvation of Tirthankar Rishabhdevji. In the current article we discussed the Space and Time, which are most debatable issues in religion, philosophy and science. The units of measure of length, mass and time employed in the history since the evolution of man, particularly since Neolithic era, are lost with advancement of society or socio-political reasons. We attempted to derive the units of space and time from historic and ancient systems viz. early civilian era to Indus Civilization to Atharvaveda Jyotisa (AJ) and to Jaina cosmology, and compare within different system of units and current modern system of units. The units of space and time in domain of religion and science reveal several paradoxes. In order to improve our understanding of the space and time models proposed by different religions and science we propose future investigations related to this subject.

With regard to units of space we started describing **Length** units from Neolithic era to Indus civilization and from Atharvaveda Jyotisa (AJ) to Jaina astronomy. In this article a significant description of length units and comparison among several systems of units as well as

with current modern system of units has been presented. For example, the man started to measure the length in a variety of ways since he appreciated the nature but could not arrive to meaningful unit until 1878 AD when 1700 yards were fixed as one mile. On the contrary, Jaina canonical literature *Anuyogadwara Sutra* (ADS) describes measurement of length through unit known as Angula (finger width), which was further presented in three magnitudes. We described in greater detail the measurement of space units, their magnitudes, gradations starting from micro (angula) to macro scale (yojana). We also compared the units of length in ADS with that described in *Triloy Pannati* (TP), and discussed the discrepancies' between two units system.

In context to macro units, we also considered description and derivation of units of celestial objects for better understanding of the cosmological distances in the universe. We first described in great detail the concepts of diurnal and declination circles in Jainism. We give examples of distances estimated for the Earth from the Sun and the Moon. Estimation of zodiacal extension of planets and naksestras has been presented. It has been noted that Jaina astronomy could not correctly arrive on real distances of planets, Sun and Moon from the Earth, which, in contrast to modern science estimation, is a paradox/ anomaly, a subject of future investigation. However, we proposed in this article, for the first time, that the distances may be in terms of the weight of the celestial object. For example the Sun is heavier and thus it is closer to the Earth relative to the Moon which is lighter than the Sun. We also considered the estimation of the extension of the Jaina universe (**14 Rajju**) in modern units and found 1 **Rajju** is equal to $\sim 1 \times 10^{23}$ kilometers or 1.5 Giga Light Years (GLY). These exercises enabled us to compare the units of space and time from microscopic to macroscopic scales in Jainism with that described in the modern science.

We further described time units starting from Neolithic to Sumerians and to Babylonians era. Smallest unit of time in Babylonian era was *gesh*. On the contrary, in Atharvaveda Jyotisha (AJ) day and night were split up into 30 *muhurtas* implying that one muhurta is equal to 48 minutes of modern time. The *muhurta* is a still popular unit of time for everyday life, celebrations and cultural activities. However, the smallest unit time was proposed as **nimesa**, which was further made equivalent to 16200 parmanukala. We compared the AJ system with Jaina system of units. However, in this article we gave, for the first time, brief but more scientific definitions of Nischayakala and Vyavharakala, basic foundations of time in Jaina system. We also described smallest of unit of time in Jaina context *i.e Samaya* and the more larger units viz. muhurtas etc. We also presented Aryabhatta system of units of time in this article.

The future investigation also needs to be focused on a number of basic issues, including whether or not space and time exist independently, particularly in context to Jainism which refers to Nischaya kala and Vyavhara Kala, while, the modern science believes in one time. More recently, it is proposed in the modern science that the reality includes consciousness in addition to space and time, which is core concept of Jainism.

Acknowledgements

I am very thankful to Dr. Brijesh Rawat, Editor, Journal of Archaeology and Culture (ICON), inviting me to contribute a series of research articles on ***“Discovery of Lost”*** for the prestigious ICON journal. Earlier in 2017 I enjoyed contributing an article regarding lost ***Ashtapad Mahatirth Palace Temple*** constructed by King Bharat Chakravarti to commemorate salvation of Tirthankar Shri Rishabhdevji. I found discussions with many acharyas/saints/monks very useful and I say to them ***Namostu Gurudev***. I also had very fruitful discussions with many scholars and friends and I express my sincere thanks to them. This work is dedicated to the eternal soul of my parents.

References:

Andrew Zimmerman Jones (2009), ***String Theory For Dummies***. John Wiley & Sons. p. 262. ISBN 9780470595848.

Atuq Eusebio Manga Qespi, ***Pacha: un concepto andino de espacio y tiempo***, Revista española de Antropología Americana, 1994, **24**, pp. 155–189, Edit. Complutense, Madrid.

Bars, I and Terning, John., ***“Extra Dimensions in Space and Time”***, Springer, 2009, pp. 27, ISBN 978-0-387-77637-8

Bondi and Gold, ***“The Steady-State Theory of the Expanding Universe,”***, 1948, MNRAS **108** pp. 252

Bose, D. M.; Sen, S.N. and Subarayappa, B.V., ***A Concise History of Science in India***, Published by Indian National Science Academy, New Delhi, 1971, pp. 80.

Bernal, J. D., ***Science in History***. Published by Watts in London, 1954, pp. 83. ISBN 0-262-52020-6

E. R. Close and Neppe, V. M., 2018, IQNexus Magazine, Vol. 10, No. 2,

Craig, William Lane, ***“Whitrow and Popper on the Impossibility of an Infinite Past”***. The British Journal for the Philosophy of Science, 1979, **30** (2), pp. 165–170.

Dwivedi, G. P., ***op. cit.***, 1959, pp. 67-68.

Dagobert D. Runes, ***Dictionary of Philosophy***, Published by Philosophical Library, UK, 1942, p. 318

Dick Teresi. 2002, *Lost Discoveries: The Ancient Roots of Modern Science--from the Baby*. Simonand Schuster. 2002, p. 174.

Einstein, Albert, *Zur allgemeinen Relativitätstheorie i.e On the General Theory of Relativity*, Preussische Akademie der Wissenschaften, Sitzungsberichte, 1915 (part 2), pp. 778–786, pp. 799–801

Graham Chapman; Thackwray Driver (2002), *Timescales and Environmental Change*. Routledge. pp. 7–8. ISBN 978-1-134-78754-8.

Hoyle, F., Burbidge, G., Narlikar, J. V. (1995). "*The basic theory underlying the quasi-steady state cosmological model*". *Proceedings of the Royal Society A* **448**:191.

Jain, L. C., "*Tiloya Pannatti Ka Ganita*", Prefixed with the JPS, Edited by A. N. Upadhye and Hira Lal Jain, 1958, p.21

Jain, L. C., "*Kinematics of the Sun and the Moon in Tiloya Pannati*", Tulsi Prajna, Published by Jaina Vishwa Bharti, Ladnun, 1975, vol.1, No.1, pp. 60-67

Jain, Rajmal, "*The Solar System in Jainism and Modern Astronomy*", Arhat Vacana, 13(1), January-March, 2001, pp. 33-42.

Jain, Rajmal, "*X-ray Spectroscopy of the Solar Flares: Spatial and Temporal Resolutions*", Asian Journal of Physics, 2008, **17**, pp. 509-532.

Jain, Rajmal, "*New Techniques to discover Ashtapad Palace Temple*", Shri Ashtapad Mahatirth – Granth-II, Published by Jain Center of America Inc., New York, USA, 2012, p. 18-48;

Jain, Rajmal, "*India into Space, and Space to Jainism*", Popular lecture delivered in Jain School, London, UK on 20 June 2014

Jain, Rajmal, "*Jain Khagol: In the perspectives of Modern Science*", Invited lecture delivered at **Chintan Prerak Parinsavad** organized by Gujarat Vishwakosh, Ahmedabad on March 14-15, 2015, paper under preparation for publication by Gujarat Vishwakosh, Ahmedabad

Jain, Rajmal and Jain, Anupam, 2017, "*Jain Units of Space and Time*" In monograph – Scientific perspectives of Jainism, eds. Samani Chaitanya Prajna, Narendra Bhandari, Narayan Lal Kachhara; Jain Vishwa Bharti Institute, Ladanun, pp. 610

Jain, Rajmal, Jain, Jeoraj and Bhandari, Narendra; 2017, "*Modern and Jain Cosmology*": *A Comparison*, In monograph – Scientific perspectives of Jainism, eds. Samani Chaitanya Prajna, Narendra Bhandari, Narayan Lal Kachhara; Jain Vishwa Bharti Institute, Ladanun, pp. 461

Kaye , G. R., *“Memoires of Archaeological Survey of India”*, Hindu Astronomy, 1923, No.18, pp. 124.

Kng, Hans, 2006, **Tracing The Way: Spiritual Dimensions of the World Religions**. A&C Black. p. 50. ISBN 9780826494238.

Lishk, S. S., *Jaina Astronomy*, Published by Arihant International, Delhi, 1980, pp.118

Lishk, S. S. and Sharma, S. D., *“Latitude of the Moon as Determined in Jaina Astronomy. Sramana”*, 1975, **27**, No.2, pp. 28-35

Lishk, S. S. and Sharma, S. D., *“Post-Vedanga presiddhantic Indian Astronomy”*, paper presented at Summer School on **History of Science** organized by INSA, New Delhi, 1974

Lishk, S. S and Sharma, S. D., *“Notion of Obliquity of Ecliptic implied in the concept of Mount Meru”*, Jain Journal, 1978, **12**, No.3, pp.79-92

Muni Mahendra Kumar, *“The Enigma of the Universe”*, 2010, Jain Vishwabharti Institute, Ladnun.

Neppe, V. M. and E. R. Close, Op.cit. 5th Edition, *Brainvoyage*. 2015.

Paul Richard Steele and Catherine J. Allen, *“Handbook of Inca Mythology”*, Published by ABCO CLIO, Oxford, England, 2004, pp. 86

Penprase, Bryan E. (2017-05-05). *The Power of Stars*. Springer. p. 182. ISBN 9783319525976.

Pokharna, S. S., *“Exploration of General Systems Theory and Jain Philosophy could provide new ways of looking at the field of Bioethics”*, Interreligious Dialogue, 2013, Issue 12 (Spring), pp. 74-82

Pokharna, S. S, Kalra, M. L., Jain, Rajmal and Samani Chaitnya Prajna (2019), *“Clairvoyant observations of atoms and quarks support ABLTS, Jainism and TDVP models that knowledge is structured in the consciousness”*, International School of Jain Studies (ISJS) Transaction, Vol. 3, No. 1, Jan-March 2019, pp. 23-44

Ram, Atma, *“Anuyogadvara Sutra”* (Hindi Translation) Ch. Time, Published by Lala Murari Lal Charan Das Jain, Patiala State, Quoted by Kumar II, Muni Mahendra, op. cit., 1931, pp.241-242

Stephen Hart and Richard Young, *“Contemporary Latin American Cultural Studies”*, Published by Hodder Arnold Publishers, London, 2003

St. Augustine, “**Confessions**”, Book XI, 1909,
<http://www.sacredtexts.com/chr/augconf/aug11.htm>

Sarton, George, “**Introduction to the history of science**”, Published by Williams & Wilkins.,
Baltimore, 1927, Volume III, part I, pp. 716

Sibiya, L., **Quoted by K. K. Shah**, University of Mysore, in his lecture at Matsciences, Madras
during February 1973

Sharma, S. D., “**Nyaya Kaumuda (Sanskrit commentry)**”, Paper presented at the International
Sanskrit Conference, Vigyan Bhawan, New Delhi, 1972

Sharma, K. V., “**Lilavati (Sanskrit commentary)**” cf. Aryabhatiyam, ch-3, verse 2, 1975, p.6.

Sushil Mittal, Gene Thursby (2012). **Hindu World**. Routledge. p. 284. [ISBN 9781134608751](https://doi.org/10.1080/00141801.2012.687511).

Thompson, Richard L., “**The Cosmology of the Bhagavata Purana: Mysteries of the Sacred Universe**”, Published by Motilal Banarsidass, 2007, pp. 225, ISBN 978-81-208-1919-1

Verma, M. R., “**The Evolution of Weights and Measures**”, Science Today, 1974, April issue,
pp. 13-20

Yabuuti, Kiyosi, “**The calendar Reforms in the Ha Dyanasties and Ideas in Their Background**”, Archives Internationales D’ Histoire Des Sciences, 1974, **24**, No. 94, pp. 51-65.

Zaveri, J. S., “**Theory of atom in the Jaina Philosophy**”, Published by Agama & Sahitya
Prakashan, Jain Vishva Bharati, Ladnu, 1975, pp.131-133

I C O N
Journal of Archaeology and Culture

Vol. 7

2020

Wakankar Rock Art and Heritage Welfare Society

Bhopal

Funded by Indian Council of Historical Research

Discovery of Lost - III

Exploring Śramaṇa Culture/ Jainism in the Tigray Region of Ethiopia

Prof. (Dr.) Rajmal Jain, FRAS

Physical Research Laboratory, Dept. of Space, Govt. of India, Ahmedabad, India

All India Digamber Jain Heritage Preservation Organization,

Shree Bharatvarshiya Digamber Jain Mahasabha, New Delhi

Dedicated to

Late Shri Nirmal Kumar Jain Sethi, National President,

Shri Bharatvarshiya Digamber Jain Mahasabha, New Delhi 110001, India

Abstract:

The excavations in the Ethiopia in general and in the Tigray region in particular revealed that in the early or even before the first millennium BCE a distinctive sacral architecture, characteristic sculptures, and inscriptions indicating religious beliefs related to the Sabaeon pantheon. This resulted from cultural interchange with South-Arabia, especially with the flourishing kingdom of Saba. On the other hand, the existence of *Śramaṇa* culture over the globe since the evolution of intelligent human being is also widely known. Thus it is of utmost importance to explore the possibility of *Śramaṇa* culture in the Tigray region of Ethiopia. In this context we visited Mekelle University and organized an international conference during May 2017, and also visited the various site of the Tigray region. In the current investigation we present evidences revealed from the study of artifacts, iconographic, archaeological, anthropological and historical details obtained from the various sites, and conclude that the *Śramaṇa* culture existed not only in Asia before the one millennium BCE but also existed in the Saudi Arabia, Yemen and Africa i.e. on both sides of the Red Sea as evidenced from the trade relations. Further, the historical, anthropological and archaeological remnants and artifacts in the Tigray region revealed that the Moon Temple in Yeha and Almaqah Temple in Wukro were basically Jain temples of Shri Chandraprabhu and Shri Aadinath (Rishabhadev) respectively and constructed almost one millennium BCE, before the birth of Shri Parshwanatha and Shri Mahvir, 23rd and 24th tirthankars of Jain religion respectively. Our study also suggested that the current society of Orthodox Christians in Africa was basically the community practicing the *Śramaṇa* culture.

1. Introduction:

In the early or little before first millennium BCE new features indicative of complex socio-economic structures appeared in the northern Horn of Africa. A number of these features, for example the emergence of a distinctive sacral architecture, characteristic sculptures, and inscriptions indicating religious beliefs related to the Sabaeon pantheon, resulted from cultural interchange with South-Arabia, especially with the flourishing kingdom of Saba. The excavations in the 1950s and 1960s at prominent

sites with apparently strong Sabaean contact, such as Yeha, Hawlti, Melazo, and Matara, suggested the period labelled “*Ethio-Sabaean*” and a “*Pre-Aksumite*” kingdom of *DKMT*, however, based on very poor epigraphic evidence. It was characterized as a strongly South Arabian stimulated polity. However, archaeological evidence of that polity and its Sabaean traits — especially in the sense of monumental objects like architecture — remained limited to a few core sites concentrated in the south of the central highlands of Eritrea and in the northern part of Tigray, especially around Aksum and Yeha, which is considered to be the ceremonial centre of that kingdom. As a result, the approach to the spatial extent of that period and a polity of as well as towards generalizing and ambiguous terms like “Pre-Aksumite” or “Ethio-Sabaean”, is now being reviewed rather critically (Finneran 2007: 110f., 117–122, 143–145). The social impact of the Sabaean contact is regarded as being largely confined to the elite only and the rarity of sites are indicative of the polity of the *DKMT*. This may be considered as a somewhat local phenomenon. For example, the area of Wuqro and K Addi Akaweh, just about 80 km was recently designated as being “beyond its conventionally recognized south-eastern borders”. Beside this reasonable critical approach, however, the question arises as to whether such statements are justified as regards the still inadequate coverage of data on archaeological sites beyond the prominent centers and especially south of the Aksum-Yeha region. In view of that situation, rescue excavations under the auspices of the Tigray Tourism and Culture Commission (TCC) have led in 2007 to the discovery of a site of more than local significance: Meqaber GaKewa, just a short distance away from the church of Abuna Garima which houses three incense burners with Ethio-Sabaic inscriptions found in the vicinity of K Addi Akaweh, situated about 5 km south-west of Wuqro; co-ordinates: 39.56E, 13.76 N (Datum Adindan; Godet, 1977). The TCC rescue excavations revealed several cult objects: a perfectly preserved libation altar with a royal dedication, a seated female statue, architectural blocks, and limestone incense burners. Their Ethio-Sabaic inscriptions, which are paleo-graphically dated to the eighth–sixth centuries BCE include references to Almaqah and to a hitherto. On the other hand, it is widely known that the Śramaṇa culture and the religion practicing this tradition known as Jainism is a fundamental and independent religion (Jacobi, 1973). The Śramaṇa culture has existing all over the globe since thousands of years before present (Gokul Prasad Jain, 1928) in various forms such as Nirgranth (Nigantha) religion, Śramaṇa culture religion etc. Recent investigation and excavation at Mohenjodaro and Harappa has shown that Jainism existed before five thousands year ago, even though Jains believe it to be eternal. Dr. Rajmal Jain (2012, 2017, 2021) claims antiquity of Jainism to be since the evolution of humanity on the planet. According to him Jainism is not a religion rather it is a science of Nature, Earth and Cosmic order. The Nirgrantha or nigantha (nudeness) was, therefore, adopted to be in tune with the nature. He described (Rajmal Jain, 2021), in this context, that Jainism appears to be eternal since the evolution of human beings with intelligence (sometimes between 50000 and 400000 years BCE). According to Jacobi Herman (1908-1927), there are traces of Jainism even in the Vedic period. Zimmer (1953) observed the existence of the Śramaṇa culture before the Aryans in India suggesting existence of Jainism before arrival of Aryans. The Jainism is like the universe, which has neither been created, nor it will be destroyed *i. e* universe/ nature has no beginning and no ending (Acharya Kanaknandi, Vishwa Dravya Vigyan, 1983, 2014).

Thus, in view of the aforesaid two contradictory opinions about the artifacts, archaeological, historical and anthropological evidences viz. Sbaean tradition and Śramaṇa Culture we at ***All India Digamber Jain Heritage and Preservation Organization (AIDJHPO)***, a unit of ***Shri Bharatvarshiya Digamber Jain Mahasabha, New Delhi*** felt to explore the Jainism outside India under the leadership of Shri Nirmal Kumar Jain Sethi, National President of the ***Mahasabha***. Shri Sethi gave me responsibility to take the lead to explore the Śramaṇa culture/ Jainism in African continent in general and in Ethiopia and Kenya in particular. In the current paper we present study of exploration of *śramaṇa* culture in the Tigray Region of Ethiopia.

2. The Tigray Region:

Tigray Region is the northernmost regional state in Ethiopia. Tigray Region is the homeland of the Tigrayan, Irob and Kunama peoples. Its capital and largest city is Mekelle. Tigray is the fifth-largest by area, the fifth-most populous, and the fifth-most densely populated of the 10 Regional States of Ethiopia. Tigray's official language is Tigrinya, rather similar to that spoken in nearby country namely Eritrea just to the North (cf. Figure 1). The total population is more than 7 million. Almost 80% people are engaged in agriculture and contributing 46% to the regional gross domestic product. The highlands have the highest population density, especially in eastern and central Tigray. The much less densely populated lowlands comprise 48% of Tigray. Tigrayans are predominantly Orthodox Christians, making up 96% of the population ("Census 2007", Tables 1, 4, 5, 6, Govt. of Ethiopia). Shown in Figure 1 is the Tigray region bordered by Eritrea to the north, Sudan to the west, the Amhara Region to the south and the Afar Region to the east and southeast. The Red Sea and across it the Yemen and Saudi Arabia may be noted. Besides Mekelle the Tigray has many historically important cities and towns such as Adigrat, Aksum, Shire, Humera, Adwa, Adi Remets, Alamata, Wukro, Maychew, Sheraro, AbiyAdi, Korem, Qwiha, Atsbi, Hawzen, Mekoni, D ansha and Zalambessa. There is also historically significant town of Yeha.



Figure 1: The map of Ethiopia showing neighboring countries. Especially the Red Sea and across it the countries Yemen and Saudi Arabia may be noted. The Tigray region is close to these countries as well as Eritrea which was earlier an integral part of it.

Since the 3rd millenium the Tigray is often regarded as the cradle of Ethiopian civilization as well as the sacred land. It was also here in Tigray, that few hundred years back two religions, ***Judaism*** and ***Christianity***, arrived in Ethiopia. However, in the current investigation we

wish to emphasize on the presence of a large **temple complex** and fertile surroundings, the capital of the 3,000 year old kingdom of Dʿmt may have been near present-day **Yeha** (Shaw, Thurstan, 1995). We also study other parts of the Tigray region to explore the Śramaṇa Culture.

2.1 Dʿmt Kingdom:

Dʿmt (Daʿəmat) was a kingdom located in Eritrea and northern Ethiopia that existed during the 10th to 5th centuries BC. Few inscriptions by or about this kingdom survive and very little archaeological work has taken place. As a result, it is not known whether Dʿmt ended as a civilization before the Kingdom of Aksum's early stages, evolved into the Aksumite state, or was one of the smaller states united in the Kingdom of Aksum possibly around the beginning of the 1st century (Uhlig, Siegbert, 2005). This kingdom developed irrigation schemes, used ploughs, grew millet, and made iron tools and weapons. Some modern historians including Stuart Munro-Hay, Rodolfo Fattovich, Ayele Bekerie, Cain Felder, and Ephraim Isaac consider this civilization to be **indigenous**, although **Sabaeen-influenced** due to the latter's dominance of the Red Sea, while others like Joseph Michels, Henri de Contenson, Tekletsadik Mekuria, and Stanley Burstein have viewed Dʿmt as the result of a mixture of **Sabaeen and indigenous** peoples (Phillipson, 2009). The most recent research, however, shows that Ge'ez, the ancient Semitic language spoken in Eritrea and northern Ethiopia in ancient times, is not derived from Sabaeen (Kitchen, Andrew, Christopher Ehret, *et al.*, 2009). There is evidence of a Semitic-speaking presence in Eritrea and northern Ethiopia at least as early as 2000 BC (Nadia Durrani, 2005, Herausgegeben von Uhlig, Siegbert, 2005). It is now believed that Sabaeen influence was minor, limited to a few localities, and disappeared after a few decades or a century, perhaps representing a trading or military colony in some sort of symbiosis or military alliance with the civilization of Dʿmt or some other proto-Aksumite state (Phillipson, 2009; Munro-Hay, Stuart, 1991).

After the fall of Dʿmt in the 5th century BC, the plateau came to be dominated by smaller unknown successor kingdoms. This lasted until the rise of one of these polities during the first century BC, the Aksumite Kingdom. This Aksumite Kingdom was able to reunite the area (Pankhurst, Richard K.P.; *Addis Tribune*) and is effectively the ancestor of medieval and modern states in Eritrea and Ethiopia using the name "Ethiopia" as early as the 4th century AD (Henze, Paul B., 2005; Munro-Hay, Stuart (1991).

2.2 Aksum Kingdom:

The Empire of Aksum at its height at times extended across most of present-day *Eritrea*, Ethiopia, *Djibouti*, Sudan, Yemen and Saudi Arabia (*cf.* Figure 1). The capital city of the empire was Axum, now in northern Ethiopia. Today a smaller community, the city of Axum was once a bustling metropolis and a cultural and economic hub. Two hills and two streams lie on the east and west expanses of the city; perhaps providing the initial impetus for settling this area. Along the hills and plain outside the city, the Aksumites had cemeteries with elaborate grave stones called *stelae*, or *obelisks*. Other important cities included *Yeha*, *Hawulti-Melazo*, *Matara*, *Adulis*, and *Qohaito*, the last three of which are now in Eritrea. By the reign of *Endubis* in the late 3rd century, it had begun minting its own currency and was named by *Mani* as one of the four great powers of his time along with *China* and the *Sassanid* and *Roman* empires. It converted to **Christianity** in 325 or 328

under *King Ezana* and was the first state ever to use the image of the cross on its coins ("Aksum", *UNESCO World Heritage Centre*.; "Mountain Constantines: The Christianization of Aksum and Iberia1"(PDF), *users.clas.ufl.edu*).

The Kingdom of Aksum was a trading empire rooted in Eritrea and northern Ethiopia (Phillipson, David, 2012). It existed from approximately 100–940 AD, growing from the proto-Aksumite Iron Age period c. 4th century BC to achieve prominence by the 1st century AD. As shown in Figure 2 Aksum became a major player on the commercial route between the Roman Empire and Ancient India via Red Sea. Aksum managed trade between India and the Mediterranean in ivory, gold, emeralds, silk, spices, agricultural products, salt, exotic animals, manufactured goods, and much more. In the first century CE, Aksum flourished. They could afford to build a powerful navy to patrol the Red Sea and protect their trade routes.

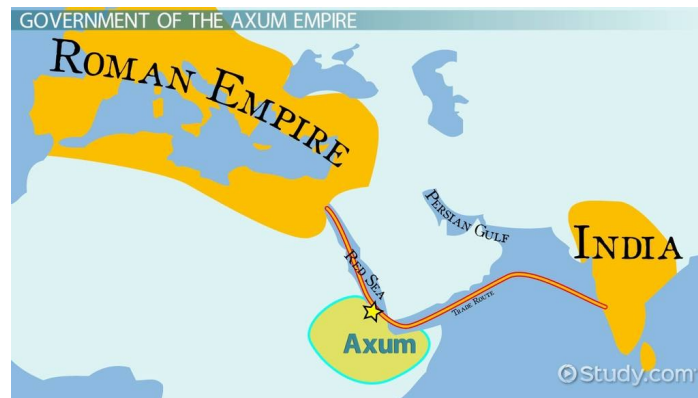


Figure 2: The trade route between Roman and Aksum Empire with India through Red Sea.

2.3 Cultural Transformations:

The trade between Aksum and India was through Red Sea and via presently known Yemen, and Gulf countries since last more than 5000 years BCE (Daniel McLaughlin *Yemen: The Bradt Travel Guide* p. 4). India was well developed and highly cultured country with sound economic conditions as well as in trading of various products. The high culture society and tradition of art and education, defense and agriculture and producing agro-products etc. were basically a follow up of *Śramaṇa culture* established by Shri Rishabhdev, the first tirthankar of Jainism (Rajmal Jain, 2021). The *Śramaṇa culture* developed around few tens of thousands of years BCE all over the globe in general and in Euro-Asia and Africa in particular (Gokul Prasad Jain, 1924). The history of Yemen describes the cultures, events, and peoples of what is one of the oldest centers of civilization in the Near East (Arabian Peninsula, 2000–1000 B.C; Timeline of Art History, The Metropolitan Museum of Art). Its relatively fertile land and adequate rainfall in a moister climate helped to sustain a stable population, a feature recognized by the ancient Greek geographer Ptolemy, who described Yemen as *Eudaimon Arabia* (better known as "*Happy Arabia*"). Yemenis had developed the South Arabian alphabet by the 12th to 8th centuries BCE, which explains why most historians date all of the ancient Yemeni kingdoms to that era. Between the 12th century BCE and the 6th century CE, it was dominated by six successive civilizations which rivaled each other, or were allied with each other and controlled the lucrative spice trade: Ma'in, Qataban, Hadhramaut, Awsan, Saba, and Himyar (Arabian Peninsula, 2000–

1000 B.C.; Timeline of Art History, The Metropolitan Museum of Art). With its long sea border between early civilizations, Yemen has long existed at a crossroads of cultures with a strategic location in terms of trade on the west of the Arabian Peninsula. Large settlements for their era existed in the mountains of northern Yemen as early as 5000 BCE (Daniel McLaughlin *Yemen: The Bradt Travel Guide* p. 4). Although little is known about ancient Yemen and how exactly it transitioned from nascent Bronze Age civilizations to more trade-focused caravan kingdoms, but since long it has been known that Yemen and nearby countries/ settlements were greatly influenced by Śramaṇa culture.

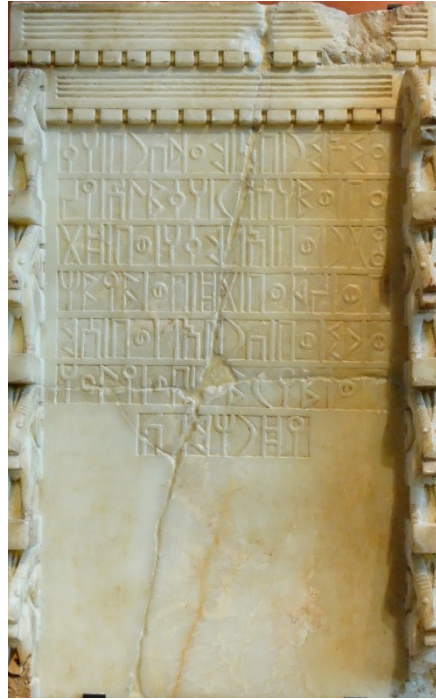


Figure 3: Sabaean inscription addressed to the moon-god Almaqah in the Tigray region, Ethiopia, mentioning five South Arabian gods, two reigning sovereigns, and two governors, 7th century BCE. The Moon-god temple exists in Yeha, near Aksum, Ethiopia, looks more likely to be a Chandra Prabhu temple of Jain tradition.

The **Sabaean Kingdom** came into existence before the eleventh century BC (Kenneth Anderson Kitchen (2003). There were four major kingdoms or tribal confederations in *South Arabia* namely **Saba, Hadramout, Qataban and Ma'in**. Saba is believed to be cultured *Sheba* and was the most prominent federation (Geoffrey W. Bromiley. *The International Standard Bible Encyclopedia*. 4. p. 254. ISBN 0802837840). The Sabaean rulers adopted the title *Mukarrib* i.e. "unifier", which means a "priest-king", similar to Śramaṇa Culture tradition in the past. The role of the Mukarrib was to bring the various tribes under the kingdom and preside over them all (Daniel McLaughlin, 2007). The Sabaens basically were highly influenced with Śramaṇa culture which was expanding from east to west. In this process transformation of Śramaṇa culture took place and Sabaens perhaps adopted Śramaṇa religion as evidenced from the Saba's knowledge of agriculture, alphabets, defense, culture *etc.*, which are the fundamental concepts of Śramaṇa culture (*cf. Inscription - Figure 3*) as well as the **Priest-King** philosophy. However, between 700 and 680 BCE Sabaean *Mukarrib Karib'il Watar I* changed his ruling title to that of a king (Werner Daum, 1987),

and conquered the entire realm of Awsan, expanding Sabaeen rule and territory to include much of *South Arabia* (*The kingdoms of ancient South Arabia*". *British Museum*. Archived from the original on 2013-12-03. Retrieved 7 February 2014.). Lack of water in the Arabian Peninsula prevented the Sabaeans from unifying the entire peninsula. Instead, they established various colonies to control trade routes. As shown in Figure 3 evidence of Sabaeen influence is found in northern Ethiopia, where the South Arabian alphabet religion and pantheon, and the South Arabian style of art and architecture were introduced (George Hatke, 2013; Teshale Tibebu, 1995 and Peter R. Schmidt, 2006), which are the integral concepts of Śramaṇa culture (Rajmal Jain, 2021). Further, the Sabaeen created a sense of identity, harmony, uniformity, equality etc. through their religion which are also nucleated around Śramaṇa culture (Rajmal Jain, 2021). For centuries, the Sabaeans controlled outbound trade across the Bab-el-Mandeb, a strait separating the Arabian Peninsula from the Horn of Africa and the Red Sea from the Indian Ocean (D. T. Potts, 2012).

3. The Śramaṇa Culture:

Śramaṇa (Sanskrit: श्रमण; Pali: samaṇa) means "one who uplifts himself by performing acts of austerity, ascetic" (Monier Monier-Williams, श्रमण śramaṇa, Sanskrit-English Dictionary, Oxford University Press, p. 1096). The term Śramaṇa is found in both Buddhist and Jain canonical texts (Olivelle, Patrick, 1993). The Śramaṇa tradition includes Jainism (Zimmer, 1952), Buddhism, and others such as the Ājīvikas, Ajñānas and Cārvākas (Svarghese, Alexander P., 2008; AL Basham, 1951). The followers of the Śramaṇa culture believe in the existence of **Atma** (jiva, soul) and its liberation to achieve **Moksha**. Śramaṇians further believe that the whole universe is full of Jiva (soul) and pudagala (ajiva/ matter). The śramaṇa culture arose from the time of the first tirthankar Shri Rishabhdev, almost few thousands of years BCE, when he taught new professional ways to begin the human civilization (*Aadi Purana* originally written by *Acharya Jinasena* in Sanskrit and translated in Hindi by Shri Panna Lal Jain, 1944). It continued for thousands of years and evolved and spread all over the globe. The 24th tirthankar Mahavir reviewed the Śramaṇa tradition and described in greater detail to adopting in daily life. The Śramaṇ culture became very popular particularly in the circles of mendicants in ancient India that led to the development of meditation and yogic practices (Samuel, 2008), probably in the sixth or fifth century BCE, around the period of Mahavir (599-527 BCE). Yogic and meditation practices developed in the same ascetic circles as the early Śramaṇa movements observed in Jains, Buddhists, and Ajivikas. The Śramaṇic traditions have beliefs in the concept of soul, fatalism to free will, idealization of extreme asceticism to that of family life, wearing dress to complete nudity in daily social life, strict ahimsa (non-violence) and vegetarianism (Padmanabh S Jaini, 2000, 2001).

Dr. Rajmal Jain (2021) described that long back Shri Rishabhdev started the religion of Nature and cosmic order, which after Mahavir known as Jainism, the followers of it are known as Śramaṇic. Shri Rishabhdev also taught six main professions to the folk of his kingdom viz. (1) *Asi* (defense), (2) *Masi* (writing skills), (3) *Krishi* (agriculture), (4) *Vidya* (knowledge), (5) *Vanijya* (trade/ commerce) and (6) *Shilp* (crafts) (Pande, Govind, 1957). In other words, he is credited with introducing *karma-bhumi* (land of actions) by founding arts and professions to enable householders to sustain themselves (Olivelle, Patrick, 1993). Rishabhdev is also credited in

Jainism to have invented and taught fire, cooking and all the skills needed for human beings to live. In total, Rishabhanatha is said to have taught seventy-two sciences to men and sixty-four to women (Olivelle, Patrick, 1993). The institution of marriage is stated to have come into existence after his marriage marked the precedence. Rishabhanatha, in Jain culture, is thus not merely a spiritual teacher, but the one who founded knowledge in its various forms, and therefore he is depicted as a form of culture hero for the current cosmological cycle (Padmanabh S Jaini, 2001).

According to Prof. Govind Pande (1957) Jains were same as the *Niganthas* mentioned in the Buddhist texts, and they were a well-established sect when Buddha began preaching. He states that "Jains" appear to have belonged to the non-Vedic Munis and Śramaṇas who may have been ultimately connected with pre-Vedic civilization". The śramaṇa system is believed by a majority of Jain scholars to have been of independent origin and not protest movements of any kind, and was pre-Buddhist and pre-Vedic (Sonali Bhatt Marwaha, 2006). On the other hand, some scholars posit that the Indus Valley Civilization symbols may be related to later Jain statues, and the bull icon may have a connection to Rishabhanatha (Puruṣottama Bilimoria; Joseph Prabhu; Renuka M. Sharma, 2007); Robert P. Scharlemann, 1985) and Institute of Indic Studies, Kurukshetra University, 1982). The Śramaṇa tradition includes Jainism of 9th-century BCE, Buddhism of 6th-century BCE, and others such as Ājīvika, Ajñāna and Cārvāka. The Śramaṇians believe in the principles of Jainism and thereby worship 24 tirthankaras.

4. Exploring the Śramaṇa Culture in the Tigray Region:

In order to exploring the Śramaṇa culture All India Digamber Jain Heritage and Preservation Organization (AIDJHPO), a unit of Shree Bharatvarshiya Digamber Jain Mahasabha, and Dept. of Philosophy, Mekelle University, Ethiopia jointly organized a two day international conference on **“African and Jain Philosophies: Indigenous Enlightenment in Peace Building”** at Mekelle University during 17th and 18th May 2017. It was attended by more than 18 Indian and 20 Ethiopian scholars. During the various presentations and discussions we found that there are few ethnographic and anthropological evidences in current religious and functional traditions of the present Orthodox Christian community. Some of the practices like fasting, vegetarianism during fasting period, offering of things by both the hands and observation of Maun (silence) *etc.* are still prevalent in this society. Moreover, the belief by this Orthodox Christian society in the soul and its liberation to achieve the moksha employing the concept of *Karma*, similar to the *Śramaṇa Culture* was a major motivation for the Indian scholars team to gather more knowledge and investigate the evidences, which may prove that this community was pertaining to Jainism before the arrival of Orthodox Christian Religion in the 4th century AD. In this context, we planned to visit Churches of this community and to hold discussions with the priest, and to visit the archeological sites in the Tigray region. With these aims we visited the Almaqah, Yeha, and Aksum sites for further research to probe the linkages with the *Śramaṇa Culture* in general and with Jain heritage in particular. Our discussions with many Ethiopian scholars and demonstrators of the sites and museums revealed that almost many sites are excavated or under excavation by German archaeologists through a bi-lateral agreement between German and Ethiopian governments. Therefore we organized several discussions with German Embassy in Addis Ababa and archaeologists.

4.1 The Great Moon Temple of Yeha:

The German archaeologists dated the YEHA Temple, known as the ***Moon Temple***, of 7th century BCE on the basis of carbon dating conducted by them. This suggests that the temple was constructed between the period of 23rd tirthankar Parshwanath and 24th tirthankar Mahavir. On the other hand, the inscription of historical events and records posted on the walls of the museum of Aksum reveal the civilization and construction around 12th century BCE, much before the birth of Pashwanatha. The temple appeared to us to be of 8th tirthankar Chandraprabhu of Jain tradition. We describe below the evidences in terms of iconography, artifacts and remnants observed by us during our two visits of the Tigray region in general and the Aksum and the Yeha Moon temple in 2017. Shown in Figure 4 is the entrance of the Moon temple.

The oldest standing building in Ethiopia is located in the village of Yeha: the **great Yeha Temple of the Moon**. This is a tower built in the Sabaean style or similar to Sravanbelgola in South India, and dated through comparison with ancient structures in South Arabia to around 700 BC, which has been confirmed by radiocarbon dating conducted by German archaeologists. Its "excellent state of preservation" has been attributed to its rededication - perhaps as early as the sixth century AD - for use as a Christian church. This suggests that the community belonging to ***Sabaean tradition*** was primarily or ***Śramaṇa Culture*** (cf. section 2 and 3) in the Tigray region, and was forcefully converted to Christianity. Perhaps this community is the Orthodox Christians, who still follow the traditions of their originality in many ways described later in this section.



Figure 4: Left panel: The sign board of the great temple of Yeha along with archaeological excavation mission between Ethiopia and Germany. Right panel: Main entrance gate of the temple, similar to many Jain temples in India. The temple is located on a small hillock.

The site of Yeha is in a modern town hidden by the Adwa chains of mountains about 53km to the west of the World Heritage Site of Aksum in Tigray State, northern part of Ethiopia. It is located in a fertile basin with an altitude of 2150m surrounded by spectacular volcanic mountain chains. **The place is a sacred area for the Ethiopian Orthodox Christians, a living memory and religious practices of the same believers with the original religion**, since the foundation of the Monastery of Abune Aftsie in the 6th century AD by one of the Nine Saints who came to the Northern Horn from the Europe and the Middle East for evangelization *i.e.* to convert Sbaean/Śramaṇa culture folk to Christian.

The site preserves two complex monumental buildings known as the Grat Be'al Geubri Palace and the Grand Temple of Yeha and two cemetery areas called the rock cut shaft tombs of Da'ero Mikael and the rock cut tombs of Abiy Addi dating to the early of the first millennium BC. It also preserves rich intact underground archaeological structures located around these monumental structures and around the tombs mentioned above dating to the same period.

The Great Temple of Yeha which dates back to about the 7th century BC was dedicated to the god of Almaqah. It was built on a hill top in excellent engineering techniques of dry masonry by joining large dressed blocks of stones. It is a rectangular building measuring 18.5 by 15 meter with a single entrance that survives up to a maximum height of 14 meter. Regular rectangular dressed block of stones up to 3 meter long were used to build its walls without mortar. This kind of construction technology had been in practice in India particularly in building Jain temples *viz.* Shravanbelgola, Moodbidri in South and Rishabhdev in Rajasthan, and Goricho Jain Mandir currently in Pakistan.

Meticulous attention was given to dress the outer faces, edges and corners giving an impression that the lines among the blocks that were carved into a superb monolithic structure. The walls of the temple are well preserved. The interior of the building presents an amazing construction style where it is possible to see the wall, of which its total thickness is about 60 cm. The floor is also superbly built with five layers of different size of dressed block of stones, some measuring 1m by 50cm, others 1m by 1m and 50cm by 50cm. In Figure 5 we show few iconographic images of the different parts of this Chandraprabhu Temple. Specially, the symbol of the Moon may be noted which all Jain temples employ to represent idol/ statue of Jaina's 8th tirthankar Chadraprabhu. The details of images are described in the caption of the figure.

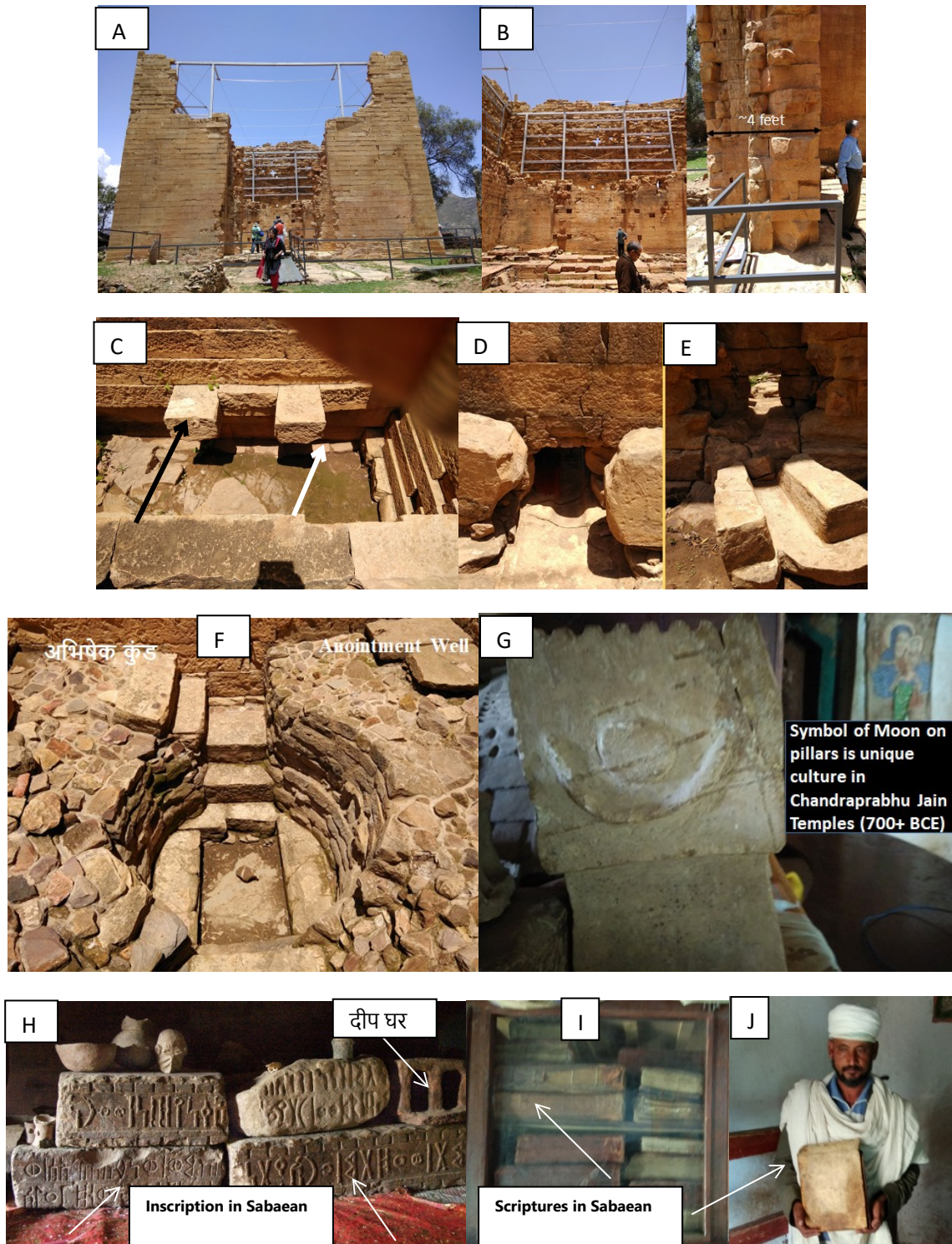


Figure 5: A. Main and single entrance gate to enter into the Moon temple. The large and high walls may be noted, and about 4-feet thick walls may be seen in B. In order to stop further erosion and damage to the structure, walls and artifacts, restoration work started by archaeology department of Ethiopia. The panel C shows the two shafts projecting out of the main wall, shown by black arrow, on which, perhaps, either the structure of the statue was mounted or else were being used to stand for conducting the process of *Abhishek* (Anointment). The *Abhishek* water was flowing into the

channel, below the statue, shown in the figure by white arrow, and then was flowing into the outlet channel made inside the temple as shown in Figure panel D. This is well-known process and engineering technology in Jain temples of old era. The panel E is outlet of the same water as seen from outside of the temple. Purified water was always being preserved in the *Abhishek* (Anointment) well which still exists and may be noted in the panel F. Most important evidence of this temple to be of tirthankar Chandraprabhu is the symbol of Moon on the main pillars of the *grabhgrah*. Piece of the pillar with the great symbol of the Moon was obtained, shown in the panel G, inside the room of nearby building which is currently under the priest. Inside this room many other artifacts, stone inscriptions, pieces of the various structures of the temple (panel H) and scriptures (panel I and J) in Sabaean language are stored, which reveal enriched culture of Jainism before 700 years BCE. The baptistery (shower room) was also found inside the temple, which is unique feature in Jain temples constructed until few hundred years back, to take shower by those who offer *Abhishek* on the statue.

However, transition from the D'mt Kingdom (before 700 BCE to the Axumite Kingdom is not known (Michael Hodd, 2002). Further, the Temple was converted to Church in 6th Century AD (David Phillipson, 2009). The Monastery was moved to its nearby present location in the early 20th century AD. It is, thus, considered by Ethiopians as a sacred place, symbol of national pride and cultural identity which is deep rooted in Ethiopian history in general and the Northern Horn in particular.

The second monumental structure of Yeha is the Palace of Be'al Geubri dating to the 8th century BC which is located about 200 m to the Northeast of the Moon Temple. It measures at least 27 m high with five floors on a squared ground plan of about 60 x 60 m as shown in Figure 6. It has a protruding stepped podium measuring up to 6 m high, built with local stones and lime mortar similar to palace and temples were being constructed in Rajasthan until hundred years before present. It was told to us that this palace was of the same king who built temple and was practicing Sabaean/ Śramaṇa culture *i. e* the ruler was a priest-king. This suggests that the king was from Jain origin. The structures of palace found during excavation by German archaeologists are shown in Figure 6.



Figure 6: The Palace of Be'al Geubri dating to the 8th century BC, which is located about 200 m to the Northeast of the Moon Temple. Shown in panel (A) is the protruding stepped podium approaching to floor. The excavated ground floor reveals (panel B) it to be at least 27 m high with five floors on a squared ground plan of about 60 x 60 m. A broken but the large standing stone graven with statue structure may be noted. The other big stone pieces may also be seen, which were used in building the palace. In the panel (C) a statue of the Jain tirthankar, although broken and not clear, marked by yellow arrow, in the side pose as in padmasan posture may be seen, and it further suggests the king might be of Śramaṇa culture origin. One of the underground rooms may be noted in panel (D) that was used to store most precious and expensive items.

The palace building has axial symmetry with projections at the corners and in the middle sides like the Axumite palaces of the first millennium AD. The entrance is located at the south-eastern flank and is designed as monumental propylene with six monolithic pillars built with local sandstone, and was accessible by ascending wide flight of stairs. The pillars originally had the heights of more than 10 m, of which 3.60 m are still preserved and each pillar weighs about 20 tons. The main stone gate which was built with local sandstone of more than six meter in height has an entrance of 1.10 m wide. The interior of the building has two corridors running in an east-west direction from which all rooms were accessible. Further, it was a multi-storied palace, constructed in wood-stone architecture. It is the largest known timber framed building in East Africa and South Arabia and the oldest example *south of the Sahara*. It marks the beginning of a long tradition of wood-framed constructions which is crucial for understanding the building traditions in the Northern Horn (<https://yehacapital.com/the-cultural-heritage-of-yeha/>).

As researches indicate, seventeen series of rock-cut graves dating to the first millennium BC that may have belonged to the rulers who probably lived at the palace of Grat Bea'l Geubri were excavated. These vertical shafts lead to one or more tomb-chambers. The grave contents of these tombs included abundant pottery, copper-alloy sickles, zoomorphic seals, other tools, and an alabaster vessel that witness the artistic and technological sophistication of the time.

We found other cemetery areas called the rock cut shaft tombs of Da'ero Mikael and the rock cut tombs of Abiy Addi dating to the early and middle of the first millennium BC. The tomb found at the foot hill of Abiy Addi, across the valley of Shillanat to the Southwest of the Grand Temple, is shown in Figure 7. Nine rock-cut tombs were partly observed located next to each other in various orientations in an area of 500m². They were cut into the rock up to two to three meters deep. A rectangular shaft of 2 x 0, 6 m leads to one or two sub-rectangular chambers with different sizes of up to 0.9 m height and 2-3.8 in length where collective burials took place, most probably successively over a long period during the first millennium BC(<https://yehacapital.com/the-cultural-heritage-of-yeha/>). Similar rock cut tombs dating to the first millennium BC are not known in the eastern sides of the Red Sea. They are only common in the stratified communities of the Northern Horn dating from the first millennium BC to the early first Millennium AD as it can be understood from some pre-Aksumite and Aksumite sites.



Figure 7: The cemetery areas called the rock cut shaft tombs of Da'ero Mikael and the rock cut tombs of Abiy Addi dating to the early and middle of the first millennium BC. The tomb found at the foot hill of Abiy Addi, across the valley of Shillanat to the Southwest of the Grand Moon Temple. Nine such rock-cut tombs were partly observed located next to each other in various orientations in an area of 500m².

The above archaeological evidence shows that the site of Yeha has outstanding universal values that merit for the inclusion to the World Heritage List. It testifies the earliest evidence for the emergence of complex culture in the Northern Horn in particular and in the sub Saharan Africa in general. This testimony is traceable in the construction techniques and designs of the Palace of Grat Be'al Geubri and the Great Moon Temple and religion and cultural practices, artistic handicrafts and inscriptions. The site of Yeha was also a political, religious and cultural Centre of highly centralized complex societies that flourished at Yeha in the early first Millennium BC, as described earlier, in the form of Śramaṇa, Sabaeen and other cultures, largely similar to Nirgrantha philosophy, particularly in the Tigray region. Thus Yeha was also the first capital city of the Ethiopia state before its transfer to Aksum.

4.2 Almaqah Temple:

Almaqah or **Almuqh** was the Sun God of the ancient Yemeni kingdom of Saba'. He was also worshipped in the kingdoms of D'mt and Aksum in Eritrea and northern Ethiopia. Almaqah's symbol is bull's head and the vine motif associated with him may have solar (head of the family) and nature/ earth/environment attributes. He was therefore a male counterpart of the Sun goddess Shamash / Ishtar / Isis, who was also venerated in Saba, but as a tutelary goddess of the royal Egyptian dynasty (Ryckmans, Jacques, 1987, 1989 and 1992). It may be noted that the symbol of bull also belongs to the Rishabhdev, the first tirthankar of Jainism and founder of Śramaṇa culture, and who developed the philosophy to worship and protect the nature/ environment or in other words philosophy of the earth and cosmic order. In this context, it was very motivational to us to explore the *Almaqah Temple*.

Meqaber GaKewa is a recently discovered site that indicates Sabaeen cultural contacts with the Ethiopian highlands. Its main temple, dedicated to Almaqah, was unearthed under the auspices of a joint Ethiopian-German co-operation established in 2008 (Wolf, P. & Nowotnick, U., 2010). The single-roomed temple with a portico and a tripartite sanctuary, situated within a large temenos, clearly resembles South Arabian prototypes and represents the southernmost architectural evidence of Sabaeen influence hitherto discovered in Ethiopia. However, many temples of above architecture of the single-roomed may be found in South India of Jain origin. The Jain temple of Halebidu in Hassan district of Karnataka in particular is of similar structure.

A number of well-preserved cult objects of outstanding quality — among them a completely preserved libation altar and a seated female statue — were found at their original places in the temple. Their Ethio-Sabaic inscriptions, paleographically dated to the early first millennium BC, mention the ancient name of Yeha for the first time and refer to a hitherto unknown king. At the same time, they reflect an African aspect by mentioning the king's mother in his affiliation. A cult installation in the central sanctuary, pottery and votive objects such as incense burners, miniature vessels, and female figurines, illuminate liturgical practices predominating in that particular region and period, which are similar to practices in Jain/ Śramaṇa culture and conducted even today. Thus it was further motivational to us to visit this temple of Almaqah. In Figure 8 we show the far-view of this temple, when it was in the process of excavation by German team. The architecture and artifacts reveal it to be a Jain Śramaṇa culture temple, which further endorses that Sabaeen culture was basically a *Śramaṇa culture*. Further, as shown in Figure 9 the idols, few centimeter in size, of

female and male protection goddess and god appear similar to Rakshak Dev in Jain tradition viz. Chakreshwari and Gomiukh, mostly found in Rishabhdev/ Aadinath temples. The statues are not highly engraved and well-crafted quality because the temple appears to be earlier than first millennium BC and perhaps at that time the well-developed craft of Indus civilization was already extinct.



Figure 8: The long view of the Almaqah temple during the process of excavation. The temple was built as per Jain culture architecture in few steps viz. Garbh grah, mandap grah, Pooja grah *etc.*, which may be evidenced from the artifacts of ruins of stone structure.



Figure 9: The small size idols of female and male protection gods. Considering the Almaqah temple of Shri Rishabhdev tirthankar, these two idols appear to be of Chakreshwari and Gomukh.

In the excavated Almaqah temple we found a white stone pedestal of rectangular shape with a provision to install the idol for anointment, as shown in Figure 10, at the location of the depression at the center using the holes. The pedestal has two projected bull mouthed outlets (paranala), one inside and the other outside, for the flow of anointment water offered as ablution for

the idol which is especially a culture only in the Jain tradition since the period of Rishabhdev. Further, the presence of two bull headed outlet projection, inside and outside of the pedestal in the Almaqah temple with the possible mounting of the idol in the center, suggests the temple to be of Bull god Shri Rishabhdev/ Aadinath, first tirthankar of Jain tradition.

The entry to the temple is from the east, which has three landings leading to libation altar. On the rear side of the central pedestal *i.e.* in the west, there are three chambers and thereby the entire structure is enclosed within a compound wall which further suggest that the Almaqah temple to be a Jain temple. The Wukro Museum displays original pedestal of the Almaqah temple along with the other excavated material (*cf.* Figure 11).

In Figure 11 we show many evidences in the form of artifacts, remnants of statue and temple and inscription. The artifacts and pieces of the statue as well as the remnants of temple pillars and mounting base *etc.* may be noted in the left panel. In the right panel we show the inscription on the white sandstones blocks that made to mounting one above other. The fractured/ broken statue of the idol, shown by red arrow, in standing/ *kayotsarg* or *khadgasan* posture above the inscription block of the stone may be noted.



Figure 10: Left: The pedestal for the anointment and ablution of the idol. The location to mount the statue/ idol at the center of the pedestal is shown as well as the bull shaped outlet behind the idol mount is shown by white arrow. Right: The second bull shaped outlet projecting on outside of the pedestal is marked by the red arrow. The excavated material may be noted as well as the remnants of the compound wall may also be noted.

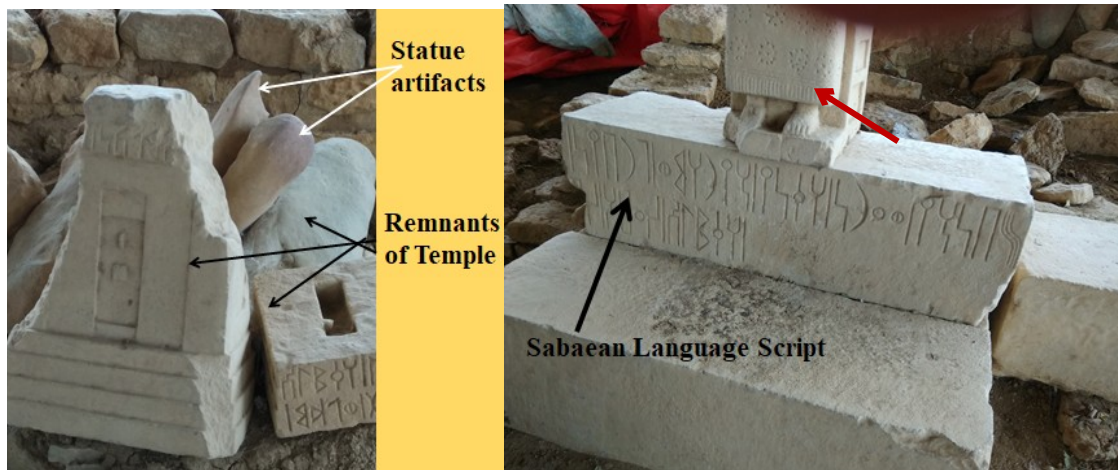


Figure 11: Left panel: The artifacts and pieces of the statue as well as the remnants of temple pillars and mounting base *etc.* may be noted. Right panel: The inscription on the white sandstones blocks made mounting one above other. Also note the fractured/ broken statue of the idol, shown by red arrow, in standing/ *kayotsarg* or *khadgasan* posture above the inscription block of the stone.

The museum displays excavated objects in many individual show cases exhibiting the material culture of that period. We found that except few articles or relics or antiquities, by and large, most of them are in the form of beads, which are in similarity with the Indian culture. Besides it, there are antiquities as Amphora port of Roman trade found all over South East Asia and other countries of the World. The pottery displayed of greater variety appears to be handmade and not well baked. The Black and Red ware of Indian Cultural affinity are also of handmade. There are presence of Mullar and Quern of granite stone with deep depression in the specimen which depicts their continuous use in long run for the preparation of pastes. Further, there is presence of multi segmented round clay or terracotta oven which in similarity with the Indian culture found in Karnataka and Rajasthan region even at present. The storage jars *etc.* have affinity with South Arabian culture. There are many specimens of the round pots that were in use as incense burners as part of worshipping in the temple complex, which, however, are identified without any burning marks by the Germans explorers.

Shown in Figure 12 (top panel) is the alleged pedestal engraved with the sign of the Moon along with a dot at the center of the rectangular stone and 9 incense burners like sharp spiked arrows that are made at the top of this rectangular stone. This structure resembles with the **Sidha Sila** (Right panel) of Śramaṇa Culture. The engraved 9 incense burners represent the sidhhas as may be noted in the right panel. The Siddh Sila is a sacred symbol in Jainism and being worshiped in the Śramaṇa Culture. Jain religious literatures have invariably discussed the Siddh Sila and referred under the Jain cosmology. Siddh sila is an area in Jain cosmology at the apex of the universe, which Jains believe that who have become *arihants* and *tirthankaras* go after attaining *moksha*, and known as *siddhas* (Kuiper, Kathleen, 2010; Rajmal Jain, 2021).



Figure 12: Left panel - The rectangular pedestal stone engraved with the sign of the Moon along with a large dot at the center and 9 incense burners like sharp spiked arrows represents evidence of Siddh Sila and a unique symbol of Jain cosmology. For comparison the Siddh Sila in Jainism is also shown in the right panel. The red arrow represents the Siddhas corresponding to the incense burner.

According to Jain tradition the lower part of the pedestal, non-Moon part, is designated as the seven Hells, while the middle part refers the zone for human and all other living beings. The upper middle part is referred as the Sixteen Heavens. The resemblance of the pedestal engraved with the Moon along with the big dot with the *Sidha Sila* is important evidence. The dot depicts the seat of pure souls *i.e.* who attained salvation, which is the fragment of alleged incense burners, and above the middle world while the lower part depicting the seven Hells signifies important evidence. However, from the excavations Germans have identified this object as incense burners which need to be probed further. Germans attempted to identify the script on the Pedestal and other fragments as *Ge-ez* and interpreted by mistake as sacrifice altars instead of ablution of Idol by placing on the pedestal and associated bull head outlets (*parнала*) to drain out the ablution water. (*cf.* Figure 10). This type of provision is invariably found in the Jain Temples for *panchamrit Abhishek* (ablution) comprised of water, milk, sandal, saffron *etc.*

We also found evidence as the presence of rolled elephant trunk in pilasters of wooden frame of entrance gate remnants of the temple complex, which are basically features of Indian architecture. In fact the artifacts seen in Figure 13 resemble and represent the six symbols of Jain Cosmic universe, particularly inscribed on the item just below the Moon arch, and visible as an Indus Text, readable from right to left as per *lexicon* given in the book “*Guide book to decipher the Indus script*” by Dr Sneh Rani Jain (2017). The second line on the same pedestal is written in *Geez* of Sabaeen tradition as identified by German experts. However, we found many stone slabs with inscriptions in the Moon Temple at Yeha and Almaqah Temple in Wuqro. The inscription appears to be of Brahmi script written in Mirror image from right to left and in retro words. Therefore, in contradiction to the German Archaeologists who proclaimed this temple to be of the Sabaeen

Culture, our observations reveal these are inverted images and retro words of Indian oldest Brahmi Script and in Sanskrit language.

Therefore we conclude that the Śramaṇa culture highly influenced the Sabaeen culture and they followed as well as practiced.



Figure 13: Top panel are remnants of the temple complex showing structure resembling with the rolled elephant trunk in pilasters of wooden frame of the entrance gate. These are basically features of Indian architecture and represent the six symbols of Jain Cosmic universe, particularly inscribed on the item just below the Moon arch, and visible as an Indus Text (*cf.* see text). The inscription found on the pedestal of the cult image in Almaqah Temple is visible on the bottom slab and has two numerical words of Western Aramaic which are not in use any more.

A bronze metal caldron that found in the museum with a message inscribed on it in the script of ancient times is shown in Figure 14. The mirror image of the inscription on it read as follows.

“The Sun God appeared 100 years after in the summer seasons to revive the Dharma/ Religion”.

In this inscription there are three numerical signs of Aramaic and others are in Brahmi script of 3rd century BC of India, period of the Chandragupta, great king of Maurya dynasty. The preliminary translation has been carried out by Mrs. Arpita Ranjan, Assistant Superintending Epigraphist from Archaeological Survey of India. On the other hand according to Prof. Norbert Nebes of DAI German Team the text corresponds to old Sabaeen inscription from Saudi Arabia of 1st millennium BC. However, the inscriptions are to be edited and translated against the background of the entire old South Arabic text Corpus published so far (by Helen Weighs). Moreover, the

German team could not give satisfactory response about the Sabaeen Culture, which they have assigned to Ethiopia region.

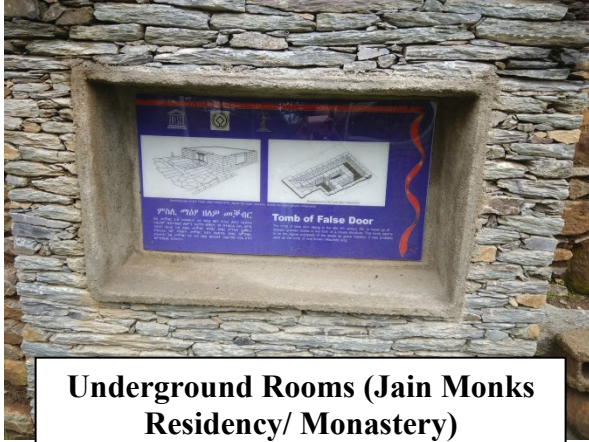


Figure 14: A bronze metal caldron with a message inscribed in the script of ancient times. The mirror image of the inscription on it reads: ***“The Sun God appeared 100 years after in the summer seasons to revive the Dharma or Religion”.***

4.3 Aksum’s Endorsement:

We visited the Aksum, the historic capital of the Aksumite Empire (*“Aksum Ethiopia” - Encyclopedia Britannica, Retrieved 24 February, 2019; Phillipson, David W. 2014*). The Aksumite Empire was a naval and trading power that ruled the region from about 1000 BCE due to its closeness to Red Ocean. In 1980, UNESCO added Axum's archaeological sites to its list of World Heritage Sites due to their historic value. Axum is located in the Maekelay Zone of the Tigray Region, near the base of the Adwa Mountains.

Knocking and Rolling over door



Dhyan Kash (Meditation Room)



Figure 15: Most significant evidences of Śramaṇa culture were found in Aksum. The top and bottom panel iconography images reveal presence of Śramaṇa Saints/ Monks residency, which is also known as Monastery. This residency of several rooms exists underground. The entrance gate is of very high technology of that era (top panel right). Seat (Aasan) of Acharya of the saint group is visible in the left of bottom panel. The meditation hall is shown in the right of the bottom panel.

Aksum endorsed the existence of Śramaṇa culture around one millennium BCE in the Tigray region in view of evidences revealed by well-preserved artifacts, remnants, historical inscriptions, cultural residuum and discussions with priests etc. Shown in Figure 15 is the major evidence of existence of Monks Residency (Monastery) where the large group of Śramaṇa saints was living and meditating. It may be specially noted that the entrance gate to this underground monastery was made of high-tech of that era. The covering door is made of single-piece rolling stone slab. Further the stones used in this monastery have special sound and upon knocking them they produce sounds of different frequencies. The entrance rolling stone door will be opened upon knocking with special sound. Similarly we found long stone slabs, perhaps, were used as sleeping beds for the saints and sounds were used to communicate with each other or to give calls for the wake-up/ meditation time/ meeting etc. Such stone pedestals with different sounds are also found in the Jain Basadi complex in Halebidu, Hassan district, Karnataka, India. The sleeping stone slabs were given a small curvature on one side to use it as a hard pillow. The monastery has small and big rooms for conducting ***Dhyaan*** (meditation) and ***Pratikraman*** (retrogression) etc.

The large scale meeting of the saints, teaching by acharyas and upadhyais to all saints, joint discussions, debates and seminars (pravachan) as well as jointly practicing the ethics of Śramaṇa/ Jainism (***Swadhyai/ self-education***) were being conducted in the open air halls and rooms. The remnants of the same are shown in Figure 16. It may be noted that this culture is still prevailing in India. The monastery and nearby existence of this saint school endorse that large number of ***Digamber*** sadhus (nude saints/ monks) were travelling and rambling in the Tigray region. It may be noted that until the salvation of 24th tirthankar Mahavir (599-527 BCE) only Digamber Jain sect was prevailing. Digambara Sādhu (also *muni*, *sādhu*) is a Sādhu in the Digambar tradition of Jainism, and as such an occupant of the highest limb of the four-fold sangha. They are also called ***Nirgranth*** which means "one without any bonds". Digambar Sādhus have 28 primary attributes which includes observance of the five supreme vows of ahimsa (non-injury), truth, non-thieving, celibacy and non-possession. A Digambar Sādhu is allowed to keep only a feather whisk (***pichhi***), a water gourd (***kamandal***) and scripture (***shastra***) with him as shown in Figure 17 (left panel). We were fortunate to see incidentally the well preserved and protected water gourd in the Museum of Addis Ababa University (*cj.* Figure 17, right panel) which further endorses that the Tigray region was highly dominated by the folk of Digamber Jain tradition sometimes one millennium BCE.



Figure 16: Remnants of the open air large and small class rooms (*Swadhyai bhavan*) for teaching religion and philosophy of Śramaṇa culture by *Acharya* and *Upadhyai* to all nude Digamber saints of the group. Discussions, debates and practicing related to religion were also being conducted here in the open air halls.



Figure 17: Left panel - Acharyashree Kanaknandi (center) along with his two fellow sadhus – munishree Suvigyasagar and adhyatmanandi gurudev. The feather whisk in their hands and the water gourd (shown by red arrow) nearby to them may also be noted. Right panel – The water gourd of ancient time, perhaps 100-1000 years BCE, well preserved in the Museum of Addis Ababa University.



Figure 18: The Obelisks (Manak Stambh) near Sant Bhavan (Monastery), a tradition in Jainism to build such four-sided tower (चतुष्कोण सतम्भ) facing to north-east, a symbolic representation of Śramaṇa culture.

Almost joint to Monks Residency/ monastery we found a large open ground where few **Obelisks** (Manak Stambh) were constructed as shown in Figure 18. To build an obelisk, four-sided tower (चतुष्कोण सतम्भ), also called Stela in front of the temple or monastery is a tradition in Jainism. However, the organizational and technological skills of the Aksumites were represented by the construction of stelae (singular: stela/stele). These monuments were created in line of older African traditions and made of single pieces of local granite. In most cases, the obelisks/ stelae mark elite and royal burial tombs. The largest stelae appear to decorate the graves of the Aksumite kings. The monoliths are spread over multiple terrains, including fields in the northern and southeastern sides of the city, the Gudit Stelae Field, and the Central Stele Park. The latter began to emerge as a regional ceremonial and settlement centre around 100 AD, and houses the finest manufactured and decorated monoliths of Aksum. Due to their height and weight, the erection of stelae was not an easy task, and the fact that many had probably already toppled before finishing the job should not come as a surprise. However, in view of history of these Obelisks, we are not sure to consider them as **Manak Stambh**.

Further, the Ethiopian Orthodox Tewahedo Church claims that the Church of Lady Mary of Zion in Axum houses the Biblical “Ark of the Covenant”, in which lie the Tablets of Stone upon which the Ten Commandments are inscribed (Hodd, Mike, *Footprint East Africa Handbook*, 2002). Ethiopian traditions suggest that it was from Axum that Makeda, the Queen of Sheba, travelled to visit King Solomon in Jerusalem and that the two had a son, Menelik, who grew up in Ethiopia but travelled to Jerusalem as a young man to visit his father's homeland. He lived several years in Jerusalem before returning to his country with the **Ark of the Covenant**. According to the Ethiopian Church and Ethiopian tradition, the Ark still exists in Aksum. The Aksum is

considered to be the holiest city in Ethiopia and is an important destination of pilgrimages (Linda Kay Davidson and David Gitlitz, *Pilgrimage, from the Ganges to Graceland: an Encyclopedia*, 2002). However, the **Ten Commandments**, also known as the **Decalogue**, are a set of philosophical principles relating to ethics and worship that play a fundamental role in the prehistoric or ancient religion of few thousands of years BCE. The artifacts and other evidences of Aksum suggest that the philosophy transformed to Aksum from Jerusalem was perhaps based on the **“Laws of Nature”**, which is same as the Śramaṇa culture in view that the commandments are similar to ethics of Śramaṇa tradition, for example practicing the fasting, non-possession, non-violence *etc.* Thus it may be concluded that Jerusalem was perhaps the capital/ main center of Śramaṇa culture in the prehistoric era on larger continent on the Earth, which included Asia and Africa. This may also be endorsed in context to similarity between Sabaeen and Śramaṇa traditions, which slowly expanded and propagated all over the globe (Gokul Prasad Jain, 1928). It may be further noted that the Jerusalem is one of the oldest cities in the world, and is considered holy/ sacred city even to the three major Abrahamic religions viz. Judaism, Christianity, and Islam. Both Israelis and Palestinians claim that the Jerusalem as their capital (Smith, William, 2017). **However, it is very important to mention that these three religions evolved in last two millenniums before present, while the Śramaṇa culture was in existence at least few millenniums years BCE.**

Throughout its long history, Jerusalem has been destroyed at least twice, besieged 23 times, captured and recaptured 44 times, and attacked 52 times (*Moment Magazine*, Archived from the original on 3 June 2008). There are many evidences suggesting that the Jerusalem had the first settlement much before the 4th millennium BCE, in the shape of encampments of nomadic folk (Greenberg, Raphael; Mizrahi, Yonathan, September, 2013). However, it is important to note that in the Canaanite period (14th century BCE), Jerusalem was named as *Urusalim*, evident from the inscriptions on ancient Egyptian tablets, probably meaning "City of **Shalem**" or the City of Śramaṇa after a Canaanite deity. Thus we may infer that the Śramaṇa culture in Yemen (Sabaeen) and Tigray region entered from Jerusalem. The above description and evidences also suggest that Makeda, the **Queen of Sheba** was inclined towards Śramaṇa culture and therefore she travelled to Jerusalem, married to Solomon and then sent to her son to learn the Śramaṇa culture and bring to the Tigray region of Ethiopia. However, later, after the evolution of Christianity and Islam in 1st century and 7th century AD respectively, Jerusalem as well as the Tigray region were destroyed significantly including very recently built the highest obelisk.

On the other hand, forcefully conversion of the Śramaṇa tradition people to Christianity or Islam was not fully successful as the larger section of the Śramaṇa folk refused to adopt Christianity in complete order. This community is called **Orthodox Christian** and still follows and practices ethics of Śramaṇa culture. They also consider the whole Tigray region as sacred and holy land of their original religion. This motivated us to study Orthodox Christianity folk in view of their current practicing the ethics and life style *etc.* Shown in Figure 19 are the images of the Orthodox Church built in last century in Aksum. We noticed that the structure of the church was greatly different from the traditional old Churches in Europe, USA and Asia, and rather it was more similar to Jain

temples. We also found that orthodox Christians when they visit the church follow the same practices as Jains. For example they put on white cloths on the upper part of the body and kneel in front of the main entrance door as shown in the left panel of Figure 19. However, following some rules of Christianity, they light up wax candlestick (मोमबत्ती) instead of Indian candle (दीपक). In order to study the ethics and practices of the orthodox Christians we visited inside the Church and discussed with both Lady Priest and Father. We were astonished inside when we heard the lyrics of the worship/ devotion prayers (cf. Figure 19 right panel) matching with Jain holy prayers (पूजा) that sung in the temples in India. However, the script/ language were different but could be understandable. Further, the dress code of prayer team and seating ethics may also be noted.



Figure 19: Left panel – The entrance gate of the “Church of Our Lady of Zion” in Aksum. The Orthodox Christians regularly visit the church and pray to God by kneeling at the gate before entering into the church from backside gate. Right panel – Orthodox Christians worshipping the God with lyrical prayer that matching with lyrics of puja conducted by Jains in temples (cf. text for more details).

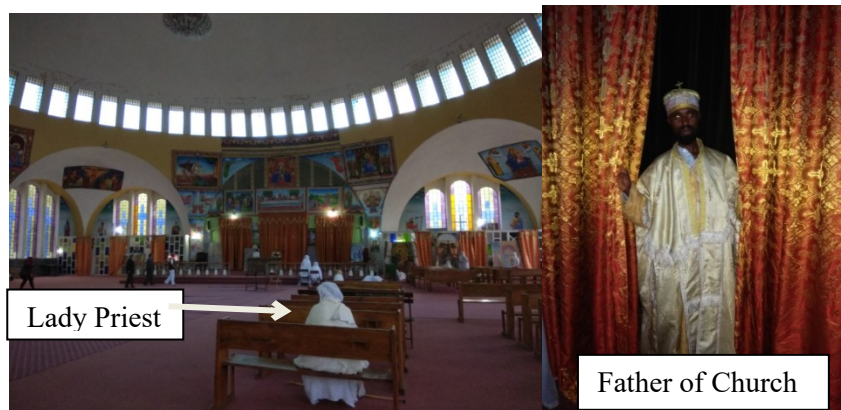


Figure 20: The Lady priest of the Church, shown by arrow in the left panel, briefed about the philosophy, ethics and practices of the Orthodox Christians. Unfortunately Father of the Church, right panel, did not know English and thus it was not possible to communicate directly but the translator helped to tell the history of the Queen of Sheba, her visit to Solomon and the son etc., and about the “Ark of the Covenant” and Ten commandments etc. (cf. text).

In Figure 20 we have shown the Lady Priest (left) and Father of the Church (right). Few orthodox Christians who came for regular worshipping got excited and accompanied us, and helped in translating their **Amharic language to understandable English**. The lady priest who knew English to some extent briefed the history, original philosophy and ethics of Orthodox Christians. According to her the original religion came from other side of the Red Ocean in the Tigray region about few thousands of years before present, and it was significantly in Sabaeen **Ge-ez** language of Yemen and Saudi Arab of present time. The philosophy of the original religion, by and large, was to attach the people with the “Earth and Cosmic Order”, and more nature oriented. It was about one millennium or more BCE when only two religious philosophies (Śramaṇa and Brahmanism) were in existence and dominance in Asia in general and in India in particular. In view of closeness with nature and environment, the Śramaṇa culture propagated and expanded very fast from Asia to Africa and later all over the globe. We all team members were very much impressed with the historical knowledge of the Lady Priest. She as well as the Chief Father Priest told that the forefathers of current Orthodox Christians community were most likely followers of the Sabaeen culture, which was derived from the Śramaṇa culture but modified to some extent in view of the oceanic region and time. However, few ethics of the fundamental philosophy were retained until thousand years AD such as non-violence, non-possession, non-stealing, forgiveness, meditation *etc.* The Orthodox community was forcefully converted to Christianity in the 1st century AD, and later to Muslims in 7th-10th century after evolution and propagation of Islam. However, Orthodox community still follows and practices a few ethics of mixed Sabaeen/ Śramaṇa culture such as observance of fasting for more than 50-200 days in a year, worship the God in the Church in a similar way as was done in the past *i.e.* putting on white cloths and then seating and kneeling (cf. Figure 19), praying the God with Bhajans/Puja along with music *etc.* We were further surprised looking at the high-tech crafted and carved **Donation Box**, kept in the central hall of this Church similar to that found in Jain and Buddha temples even today. Lady priest as well as many Orthodox folk accompanied with us mentioned that they donate some money every day after completion of worship practice. This is in similar practice followed by Ssabaeen and Śramaṇa culture followers. In spite of so many wars and attacks, cultural transformations, modifications and forceful religion conversion *etc.* over last 3 millenniums still many similarities between Śramaṇa culture and Orthodox tradition were found suggesting profound existence of Śramaṇa Culture in present Yemen, Saudi Arab in general and in the Tigray region in particular. Local legend claims the Queen of Sheba lived in this town.

The last visit camp was the archaeological and ethnographic museum in Aksum, near and opposite to the above mentioned Church, constructed in the extended area of Monk’s Residency (Monastery) and Oblesiks site.



Figure 21: The Ezana Stone written in Sabaeen, Ge'ez and Ancient Greek in 4th century AD when King Ezana was forcefully converted to Christianity.

Shown in Figure 21 is an ancient *stèle* of the **Ezana Stone**, which is still standing in modern *Axum*, the centre of the ancient *Kingdom of Aksum*. This *stone monument*, that probably dates 4th century AD, documents the forceful conversion of *King Ezana* to *Christianity* and later his conquest of various neighboring areas, including *Meroë*. This ancient Ezana Stone/ inscription is a strong evidence of entry of Christianity into the Tigray region in 4th century AD, and earlier to it was a different religion as described above. However, we found many documented inscriptions displayed in the museum as fundamental evidences about the evolution of civilization and religion in the Tigray region in general and in Aksum in particular. The documented inscription shown in Figure 23 unambiguously reveals that the earliest people in the Tigray region may have lived 500,000 years or even much before present (B.P). They used the stone tools to hunt and to gather the wild food. However, according to scientific researches development of talent in human beings started sometimes around 400,000 years B.P (Jain, Rajmal, 2021). Thus we may not expect great civilization or society with religion. It is also noteworthy that the Ethiopia is the cradle of human evolution. Based on archaeological and anthropological evidence, we think that hominids diverged from other primates somewhere between 2.5 and 4 million years ago in eastern and southern Africa. Though there was a degree of diversity among the hominid family, they all shared the trait of *bipedalism*, or the ability to walk upright on two legs. The **aridity hypothesis** suggests that early hominids were more suited to dry climates and evolved as the Africa's dry savannah regions expanded. According to the **savannah hypothesis**, early tree-dwelling hominids may have been pushed out of their homes as environmental changes caused the forest regions to shrink and the size of the savannah expand. These changes, according to the savannah hypothesis, may have caused

them to adapt to living on the ground and walking upright instead of climbing (Strayer, Robert W. and Eric W. Nelson, *Ways of the World: a Global History*, 2016; Jain, Rajmal, 2021).

The inscriptions displayed in the Archaeological and Ethnographic Museum of Aksum (cf. Figure 22) explicitly endorse the human evolution before 500000 BCE in the Aksum area and later at about 1 milleneum BCE human settlements in the Tigray region when perhaps the philosophy started. The inscription also evidences that the Aksumite empire expanded and became welathy through the buisnessmen. The trade was in the Nile valley as well as through the Adulis port – up and down the Red Sea. They traded as far as to India and Sri Lanka where the Śramaṇa Culture was already existing.

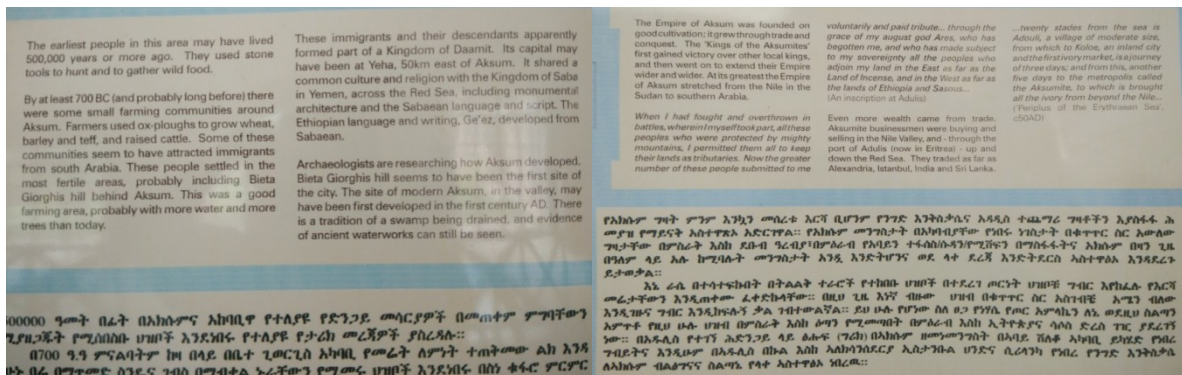


Figure 22: The inscribed document displayed in the Archaeological and Ethnographic Museum of Aksum. The script on the left panel may be noted which is a strong evidence about human evolution era and later at about 1 milleneum BCE human settlements in the Tigray region when perhaps the philosophy started. The inscription on the right panel is an evidence of how the Aksumite empire expanded and became welathy through the buisnessmen. The trade was in the Nile valley as well as through the Adulis port – up and down the Red Sea. They traded as far as to India and Sri Lanka where the Śramaṇa Culture was existing.

5. Conclusion:

In the current investigation we presented the exploratory study of the Tigray region in Ethiopia. The Indian scholars team visited Ethiopia to attend the international conference held in the Mekelle University and also visited Almaqah, Yeha and Aksum sites to explore the Śramaṇa culture in the Tigray region. With this aim we observed the artifacts, analysed the iconography details, and archaeological, anthropological and historical evidences. The study unambiguously reveals that almost one milleneum BCE the Tigray region was largely dominated by the community of Śramaṇa culture, and the ruling kings of the empire were also from this community (priest-king). This may be further endorsed from the inscription written on the *stele*/ flagstone in Sabaeen Ge'ez language. We showed that the ancient South Semitic language of the East African came from the present Yemen and Saudi Arabia, earlier Sabaeen region. We found many evidences to prove that the Tigray region was thickly populated and under dominance of Śramaṇa culture viz. the artifacts and archaeological evidences found at the Great Moon temple and the Almaqah temple, the monastery (Sant Bhavan) and the inscriptions found in the Aksum etc. The ethics and practices followed by

Orthodox Christians as well as the discussions held with priests regarding this community further endorsed that Sabaeen culture was either Śramana culture or it was highly influenced by the presence of Śramana community in the Tigray region. Shown in figure 23 is Late Shri Nirmal Kumar Jain Sethi, former president of Shri Bharatvarshiya Digamber Jain Mahasabha, New Delhi, visiting the *stele* in the *Ethnological and Archaeological* museum of Addis Ababa University. The inscription on the *stele*/ flagstone is in Sabaeen **Ge'ez** language, which is an ancient South Semitic language of the East African branch and came from the present Yemen and Saudi Arabia. The open book kept on the wooden head may be noted, which is perhaps written in the Sabaeen script. Although we could not derive the exact translation of the script written on the flagstone but the process of understanding and learning the script is in well progress. However, it is very important to mention that the Jerusalem, the oldest city of the world, was the headquarter or the central place of Śramana culture, and we showed in this study that the *Ten Commandments*, also known as the *Decalogue*, are a set of philosophical principles relating to ethics and worship that played a fundamental role in the prehistoric or ancient religion of few thousands of years BCE.



Figure 23: Late Shri Nirmal Kumar Jain Sethi, former president of Shri Bharatvarshiya Digamber Jain Mahasabha, New Delhi, visiting the *stele* in the *Ethnological and Archaeological* museum of Addis Ababa University. The inscription on the *stele*/ flagstone is in Sabaeen **Ge'ez**, language, which is an ancient South Semitic language of the East African branch and came from the present Yemen and Saudi Arabia. The open book kept on the wooden head may be noted, which is perhaps written in the Sabaeen script.

Acknowledgements:

I am honored dedicating this article to Late Sh. Nirmal Kumar Jain Sethi who gave me wonderful opportunities to explore the Jainism outside India. The current article is an outcome of these

exploring visits. With his passing away, I am missing his guidance, motivation and support to undertake future explorations of Jainism in the overseas countries. I kneel in his feet and pray for the peace of the eternal soul. I express my sincere thanks and gratitude to all Indian scholars who attended the International conference held in the Mekelle University, Ethiopia during 17-18 May 2017. I am humbled with their kind support during visit of the sites in the Tigray region described in the current paper. I greatly value the discussions held with them and suggestions provided by them. I am also overwhelmed with support and discussions with Ethiopian scholars during our visit and later until writing of this article.

References:

Acharya Kanaknandi, “Vishwa Dravya Vigyan”, (1983, Fourth edition, 2014)

"Aksum Ethiopia", *Encyclopedia Britannica*. Retrieved 2019

A,L. Basham, (1951), *History and Doctrines of the Ajivikas – a Vanished Indian Religion*, Motilal Banarsidass, ISBN 978-8120812048, pp. 94–103

D. T. Potts, (2012), *A Companion to the Archaeology of the Ancient Near East*. John Wiley & Sons. p. 1047. ISBN 978-1405189880.

Daniel McLaughlin. (2007). *Yemen: The Bradt Travel Guide* p. 5

Geoffrey W. Bromiley. The International Standard Bible Encyclopedia, 4, p. 254. ISBN 0802837840

George Hatke, (2013). Aksum and Nubia: Warfare, Commerce, and Political Fictions in Ancient Northeast Africa, NYU Press. p. 19. ISBN 978-0814762837

Greenberg, Raphael; Mizrahi, Yonathan, (2013), "From Shiloah to Silwan – A Visitor's Guide", Emek Shaveh, Retrieved 2018

Henze, Paul B., (2005) *Layers of Time: A History of Ethiopia*, ISBN 1-85065-522-7

Herausgegeben von Uhlig, Siegbert (2005); *Encyclopaedia Aethiopica*, "Ge'ez", Wiesbaden: Harrassowitz Verlag, pp. 732

Hodd, Mike, (2002), *Footprint East Africa Handbook* (New York: Footprint Travel Guides, p. 859. ISBN 1-900949-65-2

Institute of Indic Studies, Kurukshetra University, (1982), Prāci-jyotī: digest of Indological studies, Volumes 14–15. Kurukshetra University. pp. 247–249.

Jain, Gokul Prasad, (1928), “Videsho Main Jain Dharm”, Shri Bhartvarshiya Digamber Jain Mahasabha, New Delhi; Fifth edition, July, 2017

Jain, Panna Lal, Siddhantacharya, (1944), *Adipurana of Acharya Jinasena, Bhartiya Gyanpeeth*, New Delhi

Jain, Rajmal, (2021), "Antiquity of Jainism", *Journal of Archaeology and Culture, ICON*, in press.

Jerry R. Rogers, Glenn Owen Brown, Jürgen Garbrecht (2004). *Water Resources and Environmental History*, ASCE Publications. p. 36. [ISBN 0784475504](#).

Kenneth Anderson Kitchen (2003), [On the Reliability of the Old Testament](#). Wm. B. Eerdmans Publishing. p. 594. [ISBN 0802849601](#).

Kitchen, Andrew, Christopher Ehret, et al., (2009), "Bayesian phylogenetic analysis of Semitic languages identifies an Early Bronze Age origin of Semitic in the Near East", *Proceedings of the Royal Society B: Biological Sciences* 276 no. 1665 (June 22)

Kuiper, Kathleen (2010), "The Culture of India", [Rosen Publishing Group](#), p. 150, [ISBN 9781615301492](#)

Munro-Hay, Stuart (1991). [Aksum: An African Civilization of Late Antiquity](#)(PDF). *Edinburgh: University Press*. p. 57. Retrieved 1 February 2013

Nadia Durrani, (2005), *The Tihamah Coastal Plain of South-West Arabia in its Regional context c. 6000 BC – AD 600 (Society for Arabian Studies Monographs No. 4)*, Oxford: Archaeo press, 2005, p. 121

Nicholas Clapp, (2002). [Sheba: Through the Desert in Search of the Legendary Queen](#). Houghton Mifflin Harcourt. p. 204. [ISBN 0618219269](#)

Olivelle, Patrick, (1993), [The Āśrama System: The History and Hermeneutics of a Religious Institution](#), Oxford University Press, p. 14, [ISBN 978-0-19-534478-3](#)

P. M. Holt; Peter Malcolm Holt; Ann K. S. Lambton; Bernard Lewis (1977), *The Cambridge History of Islam*, Cambridge University Press. p. 7

Pande, Govind, (1957), [Studies in the Origins of Buddhism](#), Motilal Banarsidass (Reprint: 1995), p. 261, [ISBN 978-81-208-1016-7](#)).

Padmanabh S Jaini (2001), *Collected papers on Buddhist Studies*, Motilal Banarsidass, [ISBN 978-8120817760](#)

Padmanabh S Jaini (2000), *Collected papers on Jaina Studies*, Motilal Banarsidass, [ISBN 978-8120816916](#)

Puruṣottama Bilimoria; Joseph Prabhu; Renuka M. Sharma (2007). Indian Ethics: Classical traditions and contemporary challenges, Volume 1 of Indian Ethics, Ashgate Publishing Ltd. p. 315. ISBN 978-07546-330-13.

Pankhurst, Richard K.P.; Addis Tribune, (2003), "Let's Look Across the Red Sea", (archive.org mirror copy)

Peter R. Schmidt, (2006), "Historical Archaeology in Africa: Representation, Social Memory, and Oral Traditions. Rowman Altamira, p. 281. ISBN 0759114153

Phillipson, David W., (2014), Foundations of an African Civilisation: Aksum and the Northern Horn, 1000 BC - AD 1300. Boydell & Brewer Ltd. p. 69. ISBN 9781847010889. Retrieved 24 February 2019

Phillipson David W.,(2009), "The First Millennium BC in the Highlands of Northern Ethiopia and South–Central Eritrea: A Reassessment of Cultural and Political Development". African Archaeological Review. 26: 257–274. doi:10.1007/s10437-009-9064-2

Phillipson, David, W., (2012). Neil Asher Silberman (ed.). *The Oxford Companion to Archaeology*, Oxford University Press, p. 48

Richard Pankhurst, (1982), History of Ethiopian Towns (Wiesbaden; Franz Steiner Verlag, 1982), vol. 1 p. 201

Robert P. Scharlemann (1985), Naming God God, the contemporary discussion series. Paragon House, pp. 106–109. ISBN 978-0913757222.

Ryckmans, Jacques (1992), "South Arabia, Religion of", In Freedman, D.N. (ed.), The Anchor Bible Dictionary. 6. p. 172

Ryckmans, Jacques (1989), "Le Panthéon de l'Arabie du Sud préIslamique: Etat des problèmes et brève synthèse", Revue de L'Histoire des Religions. 206(2): 163

Ryckmans, Jacques (c. 1987), "The Old South Arabian Religion". In Daum, W. (ed.). Yemen: 3000 Years of Art and Civilization in Arabia Felix. p. 107

Svarghese, Alexander P. (2008), *India: History, Religion, Vision And Contribution To The World*. pp. 259–60

[Samuel, \(2008\)](#), p. 8; Quote: such (yogic) practices developed in the same ascetic circles as the early Śramaṇa movements (Buddhists, Jainas and Ajivikas), probably in around the sixth or fifth BCE.)

Shaw, Thurstan (1995), *The Archaeology of Africa: Food, Metals and Towns*, Routledge, p. 612, [ISBN 978-0-415-11585-8](#)

Smith, William (2017), "[Donald Trump confirms US will recognize Jerusalem as capital of Israel](#)". *The Guardian*. Retrieved 13 May 2017

Sneh Rani Jain; 2nd edition (2017), *The Guide Book to Decipher the Indus Script*, ISBN-13 : 978-8190614061

Sonali Bhatt Marwaha (2006), *Colors Of Truth: Religion, Self And Emotions: Perspectives Of Hinduism, Buddhism, Jainism, Zoroastrianism, Islam, Sikhism, And Contemporary Psychology*. Concept Publishing Company. pp. 97–99. [ISBN 978-8180692680](#))

1. Strayer, Robert W. and Eric W. Nelson, (2016), *Ways of the World: a Global History* (New York: Bedford/St. Martin's, 2016), 3-4.

"The Pre-Aksumite and Aksumite Settlement of NE Tigray, Ethiopia", *Journal of Field Archaeology*. **33** (2): 153.

Teshale Tibebe, (1995), The making of modern Ethiopia: 1896–1974. Lawrenceville, NJ: Red Sea Press. p. xvii. ISBN 1569020019.

Uhlig, Siegbert (ed.), (2005, *Encyclopaedia Aethiopica: D-Ha*, Wiesbaden: Harrassowitz Verlag, p. 185.

Werner Daum (1987). Yemen: 3000 Years of Art and Civilization in Arabia Felix. Pinguin-Verlag. p. 73. ISBN 3701622922.

Wolf, P. & Nowotnick, U., (2010), *The Almaqah temple of Meqaber Ga'ewa near Wuqro (Tigray, Ethiopia)*, *PSAS* 40, 363-376

[Zimmer \(1952\)](#), p. 182-183

Antiquity of Jainism

Prof. (Dr.) Rajmal Jain, FRAS, FGSA, FJAS
Physical Research Laboratory (Dept. of Space), Ahmedabad
Ahimsa Mission Foundation, Ahmedabad

Abstract:

We present the study on the “*Antiquity of Jainism*” in the perspective of pre-history, human evolution, Paleolithic and Neolithic era, and anthropological, philosophical, archaeological and scientific aspects. We found that the Śramaṇa religion exists since the human evolution with talent. It propagated very fast all over the globe, and was being followed and practiced by large section of the global folk. The study further reveals that the Jainism is truly an eternal religion and perhaps, it is the first religion on the Earth because it started with the protection of life in the whole universe. With its fundamental concept “*Paraspargraho Jivaanaam*” soon it became the religion of the Earth and Cosmic order. The Jainism in the current Awsarpani Kaal was reviewed and presented with six professional techniques by the first Tirthankar Shri Rishabhdev who born around 140000 years before present (B.P). We investigated that he maintained the culture that he received from his previous ten incarnations, the first being Mahabal around 329000 years B.P. We analyzed the very first form of Jainism “*Nigantha Tradition*”, which we also found in South America, and *Śramaṇa culture* in west Asia and across the Red Sea and concluded that ethics of Jainism were followed and practiced all over the globe during Neolithic era and pre and post Indus Valley civilization. Analysis of *Jain Kaal Chakra* in view of the historical events took place since the human evolution, including birth of Shri Rama and Shri Krishna, as well as in the context of the Milankovitch cycles of the Earth’s climate reveals many interesting features related to the eternity of the Jainism, and the same is presented in this paper.

1. Introduction:

It has been now widely established that Jainism is an eternal religion *i.e.* Jainism existed from the beginning of humanity and will exist till infinite time (von Glasenapp, Helmuth, 1925). It has also been noted that some scholars as well as religious leaders misleadingly attempt to establish that Jainism is founded recently by 24th Tirthankara Mahāvīra (527-599 BCE) or it is an offshoot of Buddhism or Hinduism. Some suggest that, perhaps, it has been established by Shri Rishabhdev, the first tirthankara of present Avastarpanikaal kaal of Kaal Chakra (Jain time cycle) and lived for 8400000 *purvas* on this planet (Zimmer, 1953). However, according to Beversluis (2000) the Jainism originating on the Indian sub-continent is one of the oldest religions of its homeland and indeed of the world, having pre-historic origins before 3000 BCE and the propagation of Indo-Aryan culture. This is further established with the verse quoted in Rigveda as follows.

ऋषभं मा समानानां सपत्नानां विषासहिम् ।
हन्तारं शत्रूणां कृधि विराजं गोपतिं गवाम् ॥१॥ (Rigveda 10.166.1)

Other examples of Rishabha appearing in the Vedic literature include verses 6.16.47 of Rigveda, 9.4.14-15 of Atharvaveda, 3.7.5.13 and 4.7.10.1 of Taittiriya Brahmana *etc.* (Bloomfield, 1906). Certainly, no doubt, the fellow tirthankaras from Ajeetnatha through Parshwanath and Mahāvīra continued the propagation of Jainism, however, adding more features and describing the concepts in greater details of foundations of Jainism. In this way the Jain religion advanced through tirthankaras over the time and in the space.

Ancient history of India reveals that there were three major religions in India *viz.* Jainism (Nirgrantha), Buddhism and Brahminism. Latest research and excavation at Mohenjodaro and Harappa has shown that Jainism existed before five thousands year ago (Jain, Rajmal, 2021). However, the Jain scriptures (Aagams) endorse that the Jainism is eternal. This fact and truth from the canonical texts suggests that the Jain religion goes back to a remote antiquity. The antiquity in question being that of the pre-Aryan, so called Dravidian illuminated by the discovery of a series of great late stone-age cities in Indus valley, dating from third to fourth millennium BCE.

Naturally the followers of every religious faith proclaim their religion as having its source in antiquity and Jains are no exception to this. The traditions and the legendary accounts prove the existence of Jainism as eternal. Jainism is revealed again and again in every cyclic period of the universe by forty-eight Tirthankaras (twenty-four in each half Time cycle). The Jainism divides the whole span of time into two equally spanned halves, Utsarpini and Avasarpini. During Utsarpini, there is a gradual ascendancy in moral and physical state of the universe, while during Avasarpini, the case is just reverse, *i.e.* the gradual descent of moral and physical state of universe. Each of these two is further subdivided into **Six Aras** (epoch) as shown in **Figure 1** and the period of these Aras in modern units of years is presented in Table I (Jain Rajmal, 2019). The time-cycle is keep going on endlessly and humans attempt to be Tirthankaras (Jina) at regular intervals by practicing the eternal principles of Jainism and attain Omniscience (**Kevala jñāna**) and preach and expound us the same.

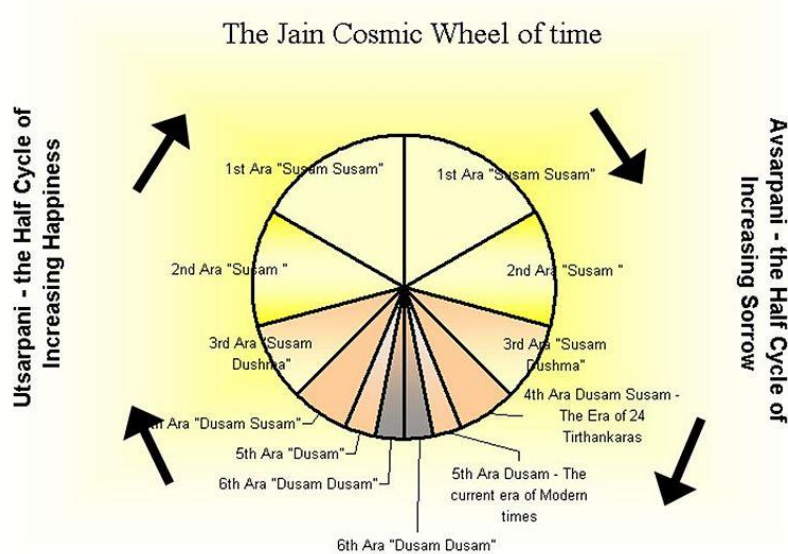


Figure 1: Kaal Chakra (Time Cycle) of the Universe as described in Jainism, which repeats again and again by the birth of forty-eight Tirthankaras (twenty-four in each half Time cycle). The Jainism divides the whole span of time into two equally spanned halves, Utsarpani and Avasarpani. Each of these two is further subdivided into *Six Aras* (epoch).

Table I
Period of Utsarpani and Avasarpani
(Unit Conversion: 10^{10} Sagaropamas=4.2 years)

| Aara (Eon) | Period | Period in Years |
|---------------------|--------------------------|-----------------|
| 1. Suṣama-suṣamā: | 400 trillion sāgaropamas | 168000 years |
| 2. Suṣamā: | 300 trillion sāgaropamas | 126000 years |
| 3. Suṣama-duḥṣamā: | 200 trillion sāgaropamas | 84000 years |
| 4. Duḥṣama-suṣamā: | 100 trillion sāgaropamas | 42000 years |
| 5. Duḥṣama: | 50 trillion sāgaropamas | 21,000 Years |
| 6. Duḥṣama- duḥṣam: | 50 trillion sāgaropamas | 21,000 Years |

Period of Utsarpani or Avasarpani is 462000 years, thus total period of one complete Kaal Chakra (Cosmic Cycle) is: 924000 years.

In this context, according to Jainism, time also exists from infinite and will never end. The basic principle of Jainism says that there is “**No God**” to create any substance. The cosmos and its components are eternal, and any changes or modifications which are visible to us, in fact, are internal of the existing system (Jain, Rajmal and Jain, Anupam, 2017). Therefore, Jainism believes that the universe is comprised of two important components: Jeeva (atma/ life) and Ajeeva (pudagal/ matter) and exist from the infinite beginning and will continue to endless time. Such principles of Jainism indicate its association with cosmic order and therefore its existence is eternal (Jain, Rajmal, 2019). However, misleadingly many investigators and scholars attempted to probe its originality in terms of physical beginning and reported that it was started by 24th tirthankar Mahāvīra and other tirthankars are mythical (von Glasenapp, 1925). On the contrary, Dr. Sarvepalli Radhakrishnan, the first vice president of India, said that the Jainism was in existence long before the Vedas were composed (Jambuvijaya, Muni, 2002). The last two tirthankaras Parshwanatha and Mahāvīra (599 – 527 BCE) are considered historical figures (Zimmer, 1953, von Glasenapp, 1925), and the Mahāvīra was a contemporary of the Buddha (Dundas, 2002). Further, according to the Jain canonical texts, the 22nd *Tirthankara* Neminatha (Sangave, 2001) lived about 85,000 years ago and was the cousin of Hindu god Krishna (Helen, 2009; Sangave, 2001). However, in this view of debate, it would be adequate to investigate the facts and dating of Shri Rishabhdeva and other tirthankars (Jain, Rajmal, 2017, 2021).

An impartial probe and investigation of the ancient history of India reveals the fact that Indians followed the trinity of religions which we call Jainism, Buddhism and Brahminism. The Jainism is also called the religion of the Nirgranthas (von Glasenapp, 1925). Latest researches and excavations have brought to light that Jainism has special significance from the view point of antiquity. In the Buddhist scripture Majjima Nikaya, Buddha himself tells us about his ascetic life and its ordinances which are in conformity with the Jain monk's code of conduct. He says, “Thus far, Sariputta did I go in my penance, I went without clothes, I licked my food from my hands. I took no food that was brought or meant especially for me. I accepted no invitation to a meal. Mrs. Rhys Davis has observed that Buddha found his two teachers Alara and Uddaka at Vaisali and started his religious life as a Jaina. At any rate Gautama gave himself up to a cause of austerities under the influence of his Jain teachers (*Buddhism and Vaisali - P. 9; The Public Relations Department Bihar*).

Dr. Rajmal Jain (2020) proposed that Jainism existed since the evolution of human beings with talent and in this connection he describes pre-historic facts related to the first tirthankar Shri Rishabhdev considering Jain canonical texts and other scientific discoveries (Jain, 2017, 2019). According to him the epic *Aadi Purana* originally written by *Acharya Jinasena* in Sanskrit and then translated in Hindi by Shri Panna Lal Jain (1944) describes in great details the ten preceding descents (दस पूर्व भव) of Shri Rishabhdev. Based on the description about *Kaal Chakra* and birth details of first tirthankar shri Rishabhdev in *Agams* as well as in the epic *Aadi Purana* and comparing them with the Earth's orbital periods known as *Milankovitch cycles* or Earth's climate cycles, Dr. Rajmal Jain estimated the period of birth of Shri Rishabhdev and his preceding first

descent (incarnation) namely “*Mahabal*” (Jain, Rajmal, 2020). Accordingly, the first tirthankar Rishabhdev born sometimes at the end phase of *3rd Ara (epoch) of current Awasarpani Kaal* and he lived throughout the 4th Ara.

The evidences of existence of Jainism in these primordial forms are found not only in India, Asia but also in the other parts of the world (Gokul Prasad Jain, 1928; J. D. Jain, 2007). Recently, Dr. Shugan C Jain translated the book “*Videsho mei Jain Dharm*” of Shri Gokul Prasad Jain in English entitled as “*Jainism Overseas*” in 2017 which was published by Shri Bharatvarshiya Digamber Jain Mahasabha, New Delhi. The book describes brief details of historical, archaeological, anthropological, religious and philosophical evidences, artifacts, inscription, remnants’ etc. of Jainism that exist in the various countries of the world. The book explicitly describes “Jainism in Abyssinia and Ethiopia” in Chapter 24. The description cites that the Greek historian Herodotus has mentioned the existence of Jain followers, known as *Gymnosophists* (the nude Jain recluses), in Abyssinia and Ethiopia. From the history of those times, in those days, thousands of Jain saints were residing here and there, all over the place, in Western Asia, Greece, Egypt and forest and hills of Ethiopia. According to Van Cromer, a famed German Scholar, the prevalent *Samānīyas* in middle-east Asia were a community of Jain Śramaṇas. The famous historian G. F. Moore (1913, 1919) has written that before the beginning of the Christian era Jain monks in thousands were roaming about far and in area of central Asia, Iraq, Siam and Palestine *etc.* and preaching their religion of *Ahimsā (Non –violence)*. These innumerable Jain monks were renowned for their renunciation and knowledge and were residing in well-designed caves all over the Western Asia, Greece, Egypt and Ethiopia. Major General J. G. R. Forlong (1897) described in his research work that Jainism was very popular in Oxiana, Samarkand, Caspia, and Balkha city. On the other hand, the Jews were extremely influenced by Jainism and the influenced folk had accordingly formed a community of their own known as *Esminee*.

Further, some scholars feel that the origin of Jainism is shrouded in considerable obscurity (*Kailasha Chandra Jain, Jaipur*). The available evidence does not decide the questions that are scanty, dubious, and capable of different interpretations. Scholars have therefore come to widely divergent conclusions. For example, Mrs. Stevenson was of the opinion (“Translations of Portions of the Rig-Veda”) that Jainism originated as a protest against the sacrifice and casteism of the Brahmanism in the 8th century BCE (<https://sites.fas.harvard.edu/~pluralsm/affiliates/jainism/article/antiquity.htm>). According to Jacobi Herman (1908-1927), there are traces of Jainism even in the Vedic period. Zimmer (1953) observed the existence of the Śramaṇa culture before the Aryans in India suggesting existence of Jainism before arrival of Aryans. Therefore, argument of Mrs. Stevenson that Jainism originated as a protest against the sacrifice and casteism of the Brahmanism in the eighth century BCE (*Kanti Chandra Jain, Jainism Resource Center – Articles, harvard.edu*) does not appear to be reliable. Glasenapp (1925) presented a misleading and unethical proposal where he suggested that Jainism's origin can be traced to the 23rd Tirthankara Parshvanatha (8th–7th century BCE) and the first twenty-two Tirthankaras as legendary mythical figures (Dundas, 2002;

Zimmer, 1953 and Sangave,, 2001). However, Jains consider their religion eternal (Zimmer, 1953, Jain, Rajmal, 2017, 2020). According to Hermann Jacobi (*On the Antiquity of Vedic Culture* (1908), there are traces of Jainism even in the Vedic period. Dr. Heinrich Zimmer (Philosophy of India, 1952) and Forlong observed that there was existence of the Śramaṇa culture before the Aryans in India. Dr. Zimmer calls it by the name of the Dravidan religion while Forlong considers it to be different from the religion of the Dravidans.

The divergence of views among the Scholars about the antiquity of Jainism is thus almost bewildering. The question has therefore to be examined and considered carefully, critically and exhaustively in order to arrive at some conclusion. Therefore, in the current paper we present investigation considering religious, historical, philosophical, anthropological, archaeological and scientific aspects, and evidences from artifacts, inscription, remnants' etc. of Jainism that exist in India as well as in the other countries of the world.

2. Jainism in the historical perspectives:

Jainism is a religion of nature or in absolute sense it is a science of earth and cosmos order (Jain, Rajmal, 2017, 2019). Therefore Jainism is an eternal religion. It is like the universe, which has neither been created, nor it will be destroyed *i. e* universe/ nature has no beginning and no ending. In this context, according to Jainism, time also exists from infinite and will never end. The basic principle of Jainism says that there is “**No God**” to create any substance. The cosmos and its components are eternal, and any changes or modifications which are visible to us, in fact, are internal of the existing system. Therefore Jainism believes that the two important components of the universe: Jeeva (atma/ life) and Ajeeva (pudagal/ matter) exist from the infinite and will continue to endless time. Such principles of Jainism indicate its association with cosmic order and therefore its existence is considered to be eternal. However, misleadingly many investigators and scholars attempted to probe its originality in terms of physical beginning and reported that it was started by 24th tirthankar Mahāvīra and other tirthankars are mythical (von Glasenapp, 1925). Based on the artifacts found in the Indus Valley civilization some scholars suggested as a link to ancient Jain culture, but according to scholars like Zimmer (1953); Sangave (2001) and Bilimoria (2007), it is highly speculative and a subjective interpretation. This theory has not been accepted by most scholars because very little is known about the Indus Valley iconography and script (Masih, 2000; Guseva, 2000).

2.1 Pre-History:

Dr. Rajmal Jain (2020) proposed that Jainism existed since the evolution of human beings with talent and in this connection he describes pre-historic facts related to the first tirthankar Shri Rishabhdev considering Jain canonical texts and other scientific discoveries (*cf.* section 6). According to him the epic ***Aadi Purana*** originally written by ***Acharya Jinasena*** in Sanskrit and then translated in Hindi by Shri Panna Lal Jain (1944) describes in great details the ten preceding descents/ incarnations (दस पूर्व भव) of Shri Rishabhdev. Dr. Rajmal Jain also estimated the

period of birth of Shri Rishabhdev and his preceding first descent namely “*Mahabal*” (cf. section 6).

Acharya Jinasena illustrated very magnificently and meticulously these ten preceding descents of Rishabhdeva in the form of a verse and that worshiped by **Soudharm-Indra** as follows.

महाबल! नमस्तुभ्यं, ललितांगाय ते नमः।
श्रीमते वङ्काजंघाय, धर्मतीर्थप्रवर्तिने॥१॥
नमः स्तादार्य ते शुद्धि-श्रिते श्रीधर! ते नमः।
नमः सुविधये तुभ्य-मच्युतेन्द्र! नमोऽस्तु ते॥२॥
वङ्कास्तंभस्थिरांगाय, नमस्ते वङ्कानाभये।
सर्वार्थसिद्धिनाथाय, सर्वार्था सिद्धिमीयुषे॥३॥
दशावतारचरम - परमौदारिकत्विषे।
सूनवे नाभिराजस्य, नमोऽस्तु परमेष्ठिने॥४॥

The names of Rishabhdeva during his earlier descents in serial order are as follows:

1. महाबल (Mahabal), 2. ललितांग देव (Lalitag Dev),
3. राजा वङ्काजंघ (Raja Vadkkajungh),
4. भोगभूमिज आर्य (Bhogbhimeej Arya),
5. श्रीधरदेव (Shridhar Dev), 6. राजा सुविधि (Raja Suvidhi),
7. अच्युतेन्द्र (Achutendra),
8. चक्रवर्ती वङ्कानाभि (Chakravarti Vadkkanabhi),
9. सर्वार्थसिद्धि के अहमिन्द्र (Ahmindra of Sarvarthsiddhi),
10. भगवान ऋषभदेव (Bhagwan Rishabhdev)

The first tirthankar Rishabhdev born sometimes at the end phase of the 3rd Ara (eon/ epoch) of current Awasarpani Kaal and he lived throughout the 4th Ara. Further, canonical texts describe that in view of his extraordinarily personality of high sensation, compassion and perception characteristics he developed asceticism noticing death of *Neelanjana*, a dancer brought by Soudharma-Indra, while dancing in the courtyard of his palace during a celebration. In fact nobody else noticed because in a very short moment Soudharma-Indra replaced by a new Neelanjana but that tragic scene of death could not be hidden from the eyes of Sh. Rishabhdev and he left everything of the palace. He immediately decided to become a monk and proceed for renunciations. In due course of time of monk and renunciations he achieved *keval jnana (Omni-knowledge)*, and later he disseminated the knowledge to many people visiting almost all

continents on the earth for a period of about one lakh years (Acharya M. S. Hemchandracharya, 1100 AD). Evidences of his visit and dissemination of *Śramaṇa culture* as well as establishing Nigantha tradition are now being found as existence of Jainism in different countries of the world (Jain Gokul Prasad, 1928; Jain Jineshwar Das, 2016). However, based on recent investigations, lectures and articles Dr. Rajmal Jain (2017, 2019, 2020) claims antiquity of Jainism to be since the evolution of humanity on the planet. According to him Jainism is not a religion rather it is science of Nature and environment. The Nirgrantha or nigantha (nudeness) was, therefore, adopted to be in tune with the nature. He described, in this context, that Jainism appears to be eternal since the evolution of human beings with intelligence (sometimes between 50000 and 400000 years BCE).

2.2 History of Śramaṇa culture:

Many scholars and researchers wrote that Jainism was in the form of *Śramaṇa* (श्रमण) tradition *i.e.*, to exert or do meditation for some higher religious purpose (Dhirasekera, Jotiya, 2007; Shults, Brett, 2016) and therefore one performs acts of austerity, ascetic (Monier Monier-Williams, 1899). The Śramaṇa tradition includes Jainism (Zimmer, 1952), Buddhism (Svarghese, Alexander P., 2008) and others such as the Ājīvikas, Ajñanas and Cārvākas (AL Basham, 1951; James G. Lochtefeld, 2002). There are some misconceptions that the śramaṇa movements arose in the same circles of mendicants from greater Magadha that led to the development of yogic practices (Samuel, 2008), as well as the popular concepts in all major Indian religions such as *saṃsāra* (the cycle of birth and death) and *moksha* (liberation from that cycle) as discussed by Flood, Gavin. Olivelle, Patrick (2003), while the fact is that the Śramaṇ culture existed much earlier, even during the pre-history era. The Śramaṇic traditions have a diverse range of beliefs, ranging from accepting or denying the concept of soul, fatalism to free will, idealization of extreme asceticism to that of family life, wearing dress to complete nudity in daily social life, strict **ahimsa** (non-violence) and vegetarianism to permissibility of violence and meat-eating (Padmanabh, S. Jaini (2000, 2001).

Historical records show that Śramaṇic tradition in general has been present uninterruptedly on the planet for over a few thousands of years and Jainism in particular on the Indian subcontinent for more than 2500 years. Jains themselves, however, understand their tradition to be beginningless and eternal, recognizing twenty-four Jinas who, in our part of the world, appear in certain epochs of time (*cf.* Figure 1) and promulgate the same fundamental doctrine (Jain, Rajmal, 2019, 2021). Scholars consider the last two of these teachers to be historical persons as evidenced by textual records. The twenty-fourth and last teacher of our current era, Mahāvīra (“Great Hero”), lived in the 6th century BCE, and the twenty-third teacher, Pārśvanātha, lived approximately 273 years before him. Prior to their liberation, both Jinas oversaw a fourfold community of monks and nuns, as well as laymen and laywomen householders (Donaldson and Bajzelj, 2021).

Mahāvīra was an elder contemporary of the Buddha, and while we do not know if they ever actually met, a Buddhist canonical text, *Sāmaññaphala-sutta*, describes Mahāvīra as one of

the *śramaṇa* leaders. This reveals that at least the Buddha knew of Mahāvīra (Jacobi, 1879; Jaini, 2001). *Śramaṇa* (“striver”) was a term used for the Buddha, Mahāvīra, and other wandering non-Vedic solitaries in the Ganges plain to differentiate them from Vedic priests and renouncers (*brāhmaṇa*) (Dundas, 2002). *Śramaṇas* rejected the authority of the Vedas and other sacred texts of the *brāhmaṇas*, their gods, as well as the efficacy of Vedic rituals (Jaini, 1979, 2001).

The “Jain” means one who follows a Jina (“Conqueror” or “Victor”). Jinās master the disciplinary practices needed to attain liberation from the cycle of rebirths, known as *samsāra*. They are also called Tīrthaṅkaras or Fordmakers because they create the ford, or *tīrtha*, for others to follow across the river of *samsāra*.

3. Jainism in the Philosophical Perspectives:

3.1 Śramaṇa (श्रमण) Philosophy:

Indian philosophy is a conflux of Śramaṇic (self-reliant) traditions, Bhakti traditions with idol worship and Vedic ritualistic nature worship. These co-exist and influence each other (Shults, Brett, 2016). However, Jain Śramaṇas had a view of *Samsara* as full of suffering (or *dukkha*) and, therefore, they practiced Ahimsa and rigorous asceticism. They believed in Karma and Moksa and viewed re-birth as undesirable.

On the contrary, the Vedic tradition believes in the efficacy of rituals and sacrifices, performed by a privileged group of people, who could improve their life by pleasing certain Gods. The Śramaṇa ideal of mendicancy and renunciation, that the worldly life is full of suffering and that emancipation requires abandoning desires and withdrawal into a solitary contemplative life, is in stark contrast with the Brahminical ideal of an active and ritually punctuated life. Traditional Vedic belief holds that a man is born with an obligation to study the Vedas, to procreate and rear male offspring and to perform sacrifices. Only in later life may he meditate on the mysteries of life. The idea of devoting one's whole life to mendicancy seems to disparage the whole process of Vedic social life and obligations (Olivelle Patrick, 1993). Because the Śramaṇas rejected the Vedas, the Vedics labelled their philosophy as “*nastika darsana*” (heterodox philosophy).

Beliefs and concepts of Śramaṇa philosophies:

- a) Denial of creator and omnipotent Gods.
- b) Rejection of the Vedas as revealed in texts.
- c) Affirmation of Karma and rebirth, Samsara and transmigration of Soul, later these practices were accepted into Vedism.
- d) Affirmation of the attainment of Moksa through Ahimsa, renunciation and austerities.
- e) Denial of the efficacy of sacrifices and rituals for purification.
- f) Rejection of the caste system.

Ultimately, the Śramaṇa philosophical concepts like ahimsa, karma, re-incarnation, renunciation, samsara and moksha were accepted and incorporated by the Brahmins in their

beliefs and practices, *e.g.* by abandoning the sacrifice of animals (Olivelle, Patrick, 1993). According to Gavin Flood, concepts like karmas and reincarnation entered mainstream brahminical thought from the Śramaṇa or the renouncing traditions (Jaini, Padmanabh S., 2001). According to D. R. Bhandarkar, the Ahimsa dharma of the Śramaṇas made an impression on the followers of Brahmanism and their law books and practices (Ghurye, G. S., 1952).

Śramaṇa in Western literature:

Various references to "śramaṇas", with the name more or less distorted, have been cited in Western literature about India. Nicolaus of Damascus (c.10 CE) wrote an account of an embassy sent by an Indian king "named Pandion (Pandyan kingdom) or, according to others, Porus" to Caesar Augustus around 13 CE. He met with the embassy at Antioch. The embassy was bearing a diplomatic letter in Greek, and one of its members was a "Sarmano" (Σαρμανο) who burnt himself alive in Athens to demonstrate his faith. The event made a sensation and was quoted by Strabo (Svarghese, Alexander P., 2008.) and Dio Cassius (AL Basham, 1951). A tomb was made to the "Sarmano", still visible in the time of Plutarch, which bore the mention "ΖΑΡΜΑΝΟΧΗΓΑΣ ΙΝΔΟΣ ΑΠΟ ΒΑΡΓΟΣΗΣ" (Zarmanochēgas indos apo Bargasēs – The Śramaṇa master from Barygaza in India).

Clement of Alexandria (150-211 AD) makes several mentions of the Śramaṇas, both in the context of the Bactrians and the Indians: "Thus philosophy, a thing of the highest utility, flourished in antiquity among the barbarians, shedding its light over the nations". And afterwards it came to Greece. First in its ranks were the prophets of the Egyptians; and the Chaldeans among the Assyrians; and the Druids among the Gauls; and the Samanaeans among the Bactrians ("Σαμαναίοι Βάκτρων"); and the philosophers of the Celts; and the Magi of the Persians, who foretold the Saviour's birth, and came into the land of Judaea guided by a star. The Indian gymnosophists are also in the number, and the other barbarian philosophers. And of these there are two classes, some of them called Sarmanae ("Σαρμάναι"), and Brahmanae ("Βραχμαναί") (Max Muller, 1884).

To Clement of Alexandria, "Bactrians" apparently means "Oriental Greek", as in a passage of the Stromata: It was after many successive periods of years that men worshipped images of human shape, this practice being introduced by Artaxerxes, the son of Darius, and father of Ochus, who first set up the image of Aphrodité Anaitis at Babylon and Susa; and Ecbatana set the example of worshipping it to the Persians; the Bactrians, to Damascus and Sardis (Gavin D. Flood, 1996). We found direct evidence from Porphyry (233-305 AD) who extensively described the habits of the Śramaṇas (whom he calls Samanaeans) in his Book IV "On Abstinence from Animal Food" (James G. Lochtefeld, 2002). He said the information was obtained from "the Babylonian Bardesanes, who lived in the times of our fathers, and was familiar with those Indians who, together with Damadamis, were sent to Caesar".

For the polity of the Indians being distributed into many parts, there was one tribe among them of men divinely wise, whom the Greeks were accustomed to call Gymnosophists. But of these there were two sects, over one of which the Brahmins preside, but over the other the

Samanaeans. The race of the Brahmins, however, received divine wisdom of this kind by succession, in the same manner as the priesthood. But the Samanaeans are elected, and consist of those who wish to possess divine knowledge (A joint report from University of Oxford; Institute of Social Anthropology; Institute of Economic Growth (India); Research Centre on Social and Economic Development in Asia, 1981).

In a recent study conducted by Dr. Rajmal Jain (2020) on the exploration of Śramaṇa tradition in west Asia and Africa, he found that the earlier Sabaeen tradition in present Saudi Arabia, Yemen Egypt and Greece was originally the Śramaṇa tradition, which propagated from India as well as from current Israel and Philistines countries where it was in dominance. Thus we may conclude that the Śramaṇa culture was well existing in various parts of the world, however, with different names and some modifications suiting to local folk and place. However, currently following two main schools of Śramaṇa Philosophy that has continued since ancient times in India.

3.2 Jain Philosophy:

Jainism derives its philosophy from the teachings and lives of the twenty-four Tirthankaras (ford-makers or enlightened teachers), of whom Mahāvīra was the last. Jain Acharyas – Bhadrabahu, Umasvati (Umasvami), Jinasena, Kundakunda, Haribhadra, Yaśovijaya Gaṇi and others further developed and reorganized Jain philosophy in its present form. The distinguishing features of Jain philosophy are its belief in the independent existence of soul and matter, predominance of karma, the denial of a creative and omnipotent God, belief in an eternal and uncreated universe, a strong emphasis on non-violence, an accent on relativity and multiple facets of truth, and morality and ethics based on liberation of the soul. The Jain philosophy of Anekantavada and Syadvada, which posits that the truth or reality is perceived differently from different points of view, and that no single point of view is the complete truth, have made very important contributions to ancient Indian philosophy, especially in the areas of skepticism and relativity (Heinrich Zimmer, 1952). Thus the Jain philosophy is derived from the long enduring and historically ancient Śramaṇa philosophy.

3.3 Buddhist philosophy:

Buddhist philosophy is a system of beliefs based on the teachings of Siddhartha Gautama, a Nepali prince later known as the Buddha. Buddhism is a non-theistic philosophy, one of whose tenets are not especially concerned with the existence or nonexistence of a God or gods and which denies the existence of a creator god. The question of God is largely irrelevant in Theravada Buddhism, though most sects of Mahayana Buddhism, notably Tibetan Buddhism and most of East Asian Buddhism (in the Shurangama Mantra and Great Compassion Mantra) do regularly practice with a number of gods (as Dharmapalas and Wrathful Deities, Four Heavenly Kings, and Five Wisdom Kings) drawn from both the Mahayana Sutras and Buddhist Tantras sometimes combined with local indigenous belief systems. The Buddha criticized all concepts of metaphysical being and non-being. A major distinguishing feature of its philosophy is the

rejection (anatman) of a permanent, self-existent soul (atman), which is in contrast to Jain philosophy.

On entering the order:

The Śramaṇa (Samanaeans) are elected. Anyone who is desirous of being enrolled in their order, he proceeds to the rulers of the city. However, he abandons the city or village that he inhabited, and the wealth and all the other property that he possessed. Having likewise the superfluities of his body cut off, he receives a garment, and departs to the Samanaeans, but does not return either to his wife or children, if he happens to have any, nor does he pay any attention to them, or think that they at all pertain to him. On the contrary, the King takes care of his children indeed, the king provides what is necessary for them, and the relatives provide for the wife. So such is the life of the Samanaeans. But they live out of the city, and spend the whole day in conversation pertaining to divinity. They also had houses and temples built by the king" (G. S. Ghurye, 1952). However, in the current era no one needs to take permission or approval from the government but approval comes from the Acharya, the leader of the Monk's sangha, who testifies the eligibility of the candidate to adopt the Sraman culture. Further, before departure from the home he himself has to make sufficient arrangement for his wife and children for their survival.

4. Jainism in the perspectives of other Religions (Anthropology):

4.1 Hinduism:

The study of various scriptures and mythological texts of **Vaishnava** religion suggests the antiquity of Jainism written in **Shivpurana**, which reveals in the following verse.

अष्ट षष्ठिसु तीर्थेषु यात्रायां यत्फलं भवेत् ।
श्री आदिनाथ देवस्य स्मरणेनापि तद्भवेत् ॥

Meaning of this verse: The fruit we obtain by visiting the 68 pilgrimages is equivalent to that much fruit gained merely by remembering Shri Adinath.

Similarly, Hinduism refers 8 incarnation of Rishabha (Rishabhavartar) out of 22 incarnation of Vishnu, which is significant inclusion of Jainism in Hindu religion and suggests that Jainism is much older than the Hinduism.

Further, it has also been told in **Mahabharat**:

युगेयुगे महापुण्यं दृश्यते द्वारिका पुरी ।
अवतीर्णो हरियंत्र प्रभासशशि भूषणः ।
रेवताद्रौ जिनो नेमियुगादि विमलाचले ।
ऋषीणामाश्रमादेव मुक्ति मार्गस्य कारणम् ।

This means: Dwarkapuri is a great zone where Hari (Shri Krishna) was incarnated, which is made splendid like the moon in the radiant area, and Neminath on the **Girnar** Mountain and

Adinath on **Kailash** "(Astapada) had existed. This region is being a hermitage of **Risies** (great ascetics) and is the instrumental for salvation path.

It has been further said in Mahabharat:

आरोहस्व रथं पार्थ गांडीवं करे कुरु ।
निर्जिता मेदिनी मन्ये निर्गुथा यदि सन्मुखे ।

O Arjuna! ride on the chariot and take **Gandeeva**-bow in hand. I know, in front of you **Digamber Muni** is coming, your victory is certain.

In the epic Rigveda it has been written:

मैं त्रैलोक्य प्रतिष्ठितानां चतुर्विंशति तीर्थकराणाम् ।
ऋषभादिवर्द्धमानान्तानां सिद्धानां शरणं प्रपद्ये ॥

This means: There are twenty four Tirthankara renowned in all the three worlds beginning from Rishabhadeva up to Vardhman Swami. I take refuge/ patronage of those liberated souls.

It has also been said in Rigveda:

मैं नग्नं सुधीरं दिग्वाससं ब्रह्मगर्भ सनातनं उपैमि वीरं ।
पुरुषमहंतमादित्य वर्णं तसमः पुरस्तात् स्वाहा ॥

That means: I further take refuge of nude, resolute, brave, naked, eternal Omniscient like Brahama, the sun-complexioned Supreme Being.

It has been said in Yajurveda:

| ॐ नमोऽर्हन्तो ऋषभो ।

I pay my obeisance to Rishabhdeva named omniscient.

It has been written in Dakshina Murti Sahasranama treatise:

| शिव उवाच । जैन मार्गरतो जैनो जितक्रोधो जितामयः ॥

Shivji told - Who takes pleasure in the Jain path such follower of Jainism overcomes anger as well as diseases.

It has been further mentioned in Nag Purana:

दशभिजितैर्विप्रेः यत्फलं जायते कृते ।
मुनेरर्हत्सुभक्तस्य तत्फलं जायते कलौ ।

Whatever fruit is gained by feeding ten Brahmins in '*Satayuga*', the same fruit is gained by giving food to a Arihant devotee (nude) Muni in this *Kaliyuga*.

It should also be noted that there is narration of *Rishabhdeva* in chapter 2 to 6 of the fifth canto of Bhagwat. The gist of which is that out of fourteen Manus Rishabhdeva took birth as the grandson of first Manu Swambhoo and the son of Nabhi who was the first preacher of Jainism. However, it does not match with the text described by Acharya Jinasena in Aadi Purana. On the other hand, ecological prayers of Rishabhdeva have been described in 141 precepts of Rigveda. There are many such examples in several Hindu texts.

4.2 Buddhism:

It is written in Buddha Mahavagga - A great number of nude saints (**Digamber Sadhoo**) were delivering religious sermons on each road of Vaishali. It is written in Aguttar Nikaya - the son of Nath (**Tirthankara** Mahāvīra) was Omni-seer, having infinite knowledge and fully alert at every moment and was placed in the form of Omniscient. **Tirthankara** Rishabhdeva has been told as an unattached and passionless **Tirthankar** and a real spiritual authority in Manjoo Shrikalpa text. In Niyayabindu, **Teerthanaka** Mahāvīra has been described as Omniscient, i.e. **Tirthankara** having omniscience, a real spiritual authority. It is also written in Majjhimnikaya that **Tirthankara** Mahāvīra was an Omniscient, Omni-seer and a scholar of entire knowledge and philosophy.

Jain Pali canonical literature too mentions names of Pūraṇa Kassapa, Makkhali Gosāla and Sañjaya Belatṭhaputta and the Nigaṇṭha Nātaputta who were teachers as well as well-known and famous founders of schools, and popularly regarded as saints (Gavin D. Flood, 1996). Nigaṇṭha Nātaputta (Pāli; Skt.: Nirgrantha Jñātaputra) refers to Mahāvīra (D. R. Bhandarkar, 1989). The Pali Canon is the only source for Ajita Kesakambalī and Pakudha Kaccāyana (McEvilley, Thomas, 2002). During the life of Buddha and Mahāvīra who were leaders of their śramaṇa orders. Nigaṇṭha Nātaputta refers to Mahāvīra, and Jains were same as the Niganthas mentioned in the Buddhist texts, and the Jains were a well-established sect when Buddha began preaching.

Further, the archaeological evidences indicate that Jain religion is older than Buddhism. Mohan-Jo-daro and Harappan excavations are its example (cf. section 5). Also the mythological evidences also indicate that Gautam Buddha first adopted Jainism and became Jain monk but due to hard life and practices of Jain monk he later adopted middle way (मध्यम मार्ग) and established Buddha religion. In fact, Gautama Buddha regarded extreme austerities and self-mortification as useless or unnecessary in attaining enlightenment and recommending, instead, a "middle way" between the extremes of hedonism and self-mortification. This philosophy of Gautam was opposed by Devadatta, a cousin of Gautama, caused a split in the Buddhist Saṅgha by demanding more rigorous practices. On the other hand, followers of Mahāvīra continued to practice fasting and other austerities. Pande (1957) states, without identifying supporting evidence, that "*Jainas* appear to have belonged to the non-Vedic Munis and Śramaṇas who may have been ultimately connected with pre-Vedic civilization". The śramaṇa system is believed by

a majority of Jain scholars to have been of independent origin and not a protest movement of any kind, and was pre-Buddhist and pre-Vedic (Sonali Bhatt Marwaha, 2006). Some scholars posit that the Indus Valley Civilization symbols may be related to later Jain statues, and the bull icon may have a connection to Rishabhanatha (Puruṣottama Bilimoria, Joseph Prabhu, Renuka M. Sharma, 2007); Institute of Indic Studies, Kurukshetra University (1982); Robert P. Scharlemann (1985).

We would like to mention that all other non-Vedic or Abrahamic religions evolved in present era *i.e.* in the last 2000 years.

5. Jainism in the perspectives of Archaeological Evidences:

The enriched heritage and culture of Jainism has also been studied by archaeologists of India and other countries. In this context, the antiquity of Jainism has been proven by the Archaeology Survey of India formed during British Raj.

5.1 Indus Valley Civilization:

The **Indus Valley Civilisation (IVC)** was a Bronze Age civilization in the northwestern regions of South Asia, lasting from 3300 BCE to 1300 BCE, and in its mature form from 2600 BCE to 1900 BCE (Wright, 2010). Together with ancient Egypt and Mesopotamia, it was one of three early civilizations of the Near East and South Asia, and of the three, the most widespread, its sites spanning an area stretching from today's north-east Afghanistan, through much of Pakistan, and into western and north-western India (Dyson, 2018). It flourished in the basins of the Indus River, which flows through the length of Pakistan, and along a system of perennial, the vicinity of the seasonal Ghaggar Hakra river in north-west India and eastern Pakistan (Dyson, 2018).

The civilization's cities were noted for their urban planning, baked brick houses, elaborate drainage systems, water supply systems, clusters of large non-residential buildings, and new techniques in handicraft (carnelian products, seal carving) and metallurgy applications of copper, bronze, lead, and tin in various household items (Wright, 2009). This suggests that talented, religious and commercial knowledge based society might have been existing in large number, which signals prevailing of the Jain community.

The large cities of Mohenjo-daro and Harappa very likely grew to contain between 30,000 and 60,000 individuals, and the civilization itself during its florescence may have contained between one and five million individuals (McIntosh, Jane, 2008). However, gradual drying of the region's soil during the 3rd millennium BCE may have been the initial spur for the urbanization associated with the civilization, but eventually weaker monsoons and reduced water supply caused the civilization's demise, and caused its population to scatter eastward and southward (Dyson, 2018). The Indus civilization is also known as the **Harappan Civilization**, after its type site, Harappa, the first of its sites were excavated early in the 20th century in what was then the Punjab province of British India and now is Pakistan (Habib, Irfan, 2015). The discovery of Harappa and soon afterwards Mohenjo-daro was the culmination

of work beginning in 1861 with the founding of the Archaeological Survey of India during the British Raj (Wright, 2010). There were, however, earlier and later cultures often called Early Harappan and Late Harappan in the same area; for this reason, the Harappan civilization is sometimes called the **Mature Harappan** to distinguish it from these other cultures. The mature Harappan society and well developed technology for house planning and construction as well as the techniques of use of metal applications etc. reveal that Jain societies were also customary in the Indus Valley Civilization (IVC). This may be further endorsed from the currently existence of large number of Jain temples in Afghanistan, Pakistan and in the Punjab, Haryana of India where the archaeological evidences of IVC have been found.

Signatures of existence of Jainism during the Neolithic era were demonstrated by Dr. Rajmal Jain (2012) considering prevailing of Śramaṇa culture around 10000 BCE. The pre-Harappan civilization observed in Mehrgarh was also a Neolithic (7000 BCE to 2500 BCE) mountain site in the Baluchistan province of Pakistan (Hirst, K. Kris, 2005), which gave new insights on the emergence of the Indus Valley Civilization (Chandler, Graham, 1999). Mehrgarh is one of the earliest sites with evidence of farming and herding in South Asia. Mehrgarh was influenced by the Near Eastern Neolithic, with similarities between "domesticated wheat varieties, early phases of farming, pottery, other archaeological artefacts, some domesticated plants and herd animals (Singh, Sakshi; et al., 2016). Jean-Francois Jarrige argues for an independent origin of Mehrgarh. Jarrige notes "the assumption that farming economy was introduced full-fledged from Near-East to South Asia, and the similarities between Neolithic sites from eastern Mesopotamia and the western Indus valley, which are evidence of a *"cultural continuum"* between those sites. But given the originality of Mehrgarh, Jarrige concludes that Mehrgarh has an earlier local background," and is not a "'backwater' of the Neolithic culture of the Near East (Jarrige, Jean-Francois, 2008), which suggests existence of a community with good economic, religious and civilized sense. This community is likely to be from Śramaṇa culture and accordingly the renowned Archaeologist Dr. Rakhaladas Banarjee has investigated Indus valley civilization. He found something has been written on the seal No. 449 excavated from IVC. Prof. Pran Nath Vidyalkar has read it as 'Jineswar' (Jin-e-e-israh - जिन-इ-इ-इसर:). According to the statement of the Archaeologist Rai Bahadur Chandra (1920) one idol has been found in the seals of the Indus valley in which disposition of renunciation and aversion from worldly enjoyments identical with the idol of Lord (**Tirthankara**) Rishabhdeva in standing posture of Mathura are seen. Moreover, the idol which is engraved on seal No. 2 F.G.H., the disposition of renunciation is precisely clear on it and below the figure of the idol there is also the figure of the bull which is a symbol of Tirthankara Rishabhdeva. On the basis of all these facts, many learned scholars have regarded the Jainism as of the period much before the Indus valley civilization.

On the other hand, the main part of the nude human body found in Harappa also indicates the existence of Jain **Tirthankaras** or monks/ sadhus in Indus valley civilization. Dr. T. N. Ramchandran, Director General of the central Archaeological department has written after profound study: "The engraved idol in meditative relaxation posture found in the investigation of

Harappa, is fully a Digamber Jain idol'. The '**Kankali Teela**' of Mathura is most important from the view-point of Jain Archaeology. In its excavation, apart from an extremely ancient deities-created mound (a dome-shaped monuments containing relics), whose creation-period is not known, one hundred ten rock inscriptions and hundreds of idols have been found which range from second century B.C. to 12th century. According to Archaeologists the above mentioned mound was rebuilt in eighth century B.C. According to Dr. Vincent A. Smith it is proved from the investigation related to Mathura that the existence of Jain **Tirthankaras** was there much earlier to Christian era. Recognition of **Tirthankara** Rishabhdeva and, in fact, all 24 **Tirthankaras** was in vogue from ancient time. (Jain Siddhant Shikshan: Muni Pramansagar ji). It is further proven from the rock inscription of **Hathi gufa** that got carved under the guidance of Emperor Kharvel that the installation and worshipping of the idol of Rishabhdeva is in vogue from ancient time. It is widely known that logo/badge of the Jain tirthankaras are related to the Earth and cosmic order suggesting the Jainism is a religion of Nature and Environment. The logo/ symbol of the 16 tirthankars are of animals as shown in Figure 2, and for other 8 tirthankars it is related to either biosphere or cosmos, and it is very interesting to note that the seals excavated from the Indus Valley Civilization also reveal the similar symbols. For example, as shown in Figure 3, many seals reveal engraved images of animals' viz. bull, horse, elephant, goat, unicorn etc., which are in common to symbols of Jain tirthankars. On the other hand, the **Swastika** seals of Indus Valley Civilization, safely kept in British Museum, reveal evidence of existence of Śramaṇa tradition/ Jainism before Indus civilization as the swastika is a symbol/ logo of 7th Jain tirthankar Suparshwanath. In fact, swastika is a sacred icon of all Śramaṇa traditions in India in general and of Jainism in particular.

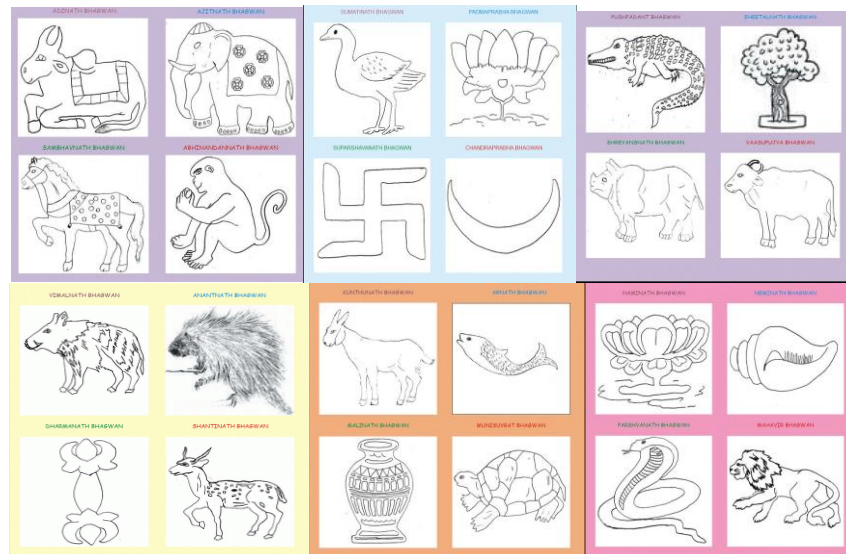


Figure 2: The logo/ symbols of 24 Jain Tirthankars. Name of each tirthankar is written at the top of the symbol. It may be noted that 16 symbols are of animals for which the tirthankars struggled to stop their sacrificial. The other 8 symbols are related to plant biosphere, cosmopshere and

social environment *viz.* lotus flowers, Kalp tree; Swastika, Moon, and Kalash, shankh and Vajra gada.



Figure 3a: Stamp seals of the Indus Valley Civilization with Indus script; probably made of steatite; saved in the British Museum. Note the structure of animals engraved on the seals, such as bull, horse, elephant, goat etc., that resembling with logos/ symbols of many Jain tirthankars (*cf.* Figure 2).



Figure 3b: Left - Stamp seals of the Indus Valley Civilization revealing unambiguously the unicorn (with incense burner), a symbol of 11th Tirthankar Shreyasnatha of Jainism (*cf.* Figure 2). Right - Impression of a cylinder seal of the Akkadian Empire, with label: "The Divine Sharkalisharri Prince of Akkad. The long-horned buffalo is thought to have come from the Indus Valley, and testifies to exchanges with Meluhha, the Indus Valley civilization, 2217-2193 BCE, Louvre Museum. However, it should be noted that the carved buffalo is a symbol of 12th Tirthankar Vasupujya of Jaina.



Figure 3c: Swastika seals of Indus Valley Civilization in British Museum. The swastika is a symbol/ logo of Jain tirthankar Suparshwanath, and, in fact, swastika is a sacred icon in all Śramaṇa traditions in India in general and in Jainism in particular.

The major evidence of existence of Jain tradition before the Indus Valley Civilization is obtained from the seal of **Siddha Shila** as shown in Figure 4. According to Jain/ Śramaṇa tradition the **Siddha shila** is an area in Jain cosmology at the apex of the universe, where the people who have become *arihants* and *tirthankaras* go after their salvation and attain *moksha*. Such people are called *siddhas* after they discard their mortal body (Kuiper, Kathleen, 2010). The structure of the Siddha Shila appears like a crescent moon in Jainism as shown in the bottom side of the Figure 4. On comparing we find similarities in large except in the top image we find birds flying in opposite direction and at the center location of Siddhas, while in the bottom image the Siddhas are shown above the crescent moon. However, the seal represents boat kind of structure, and thus it may also be interpreted as the source to cross this miserable world and birds indicate to fly away from “*Sansara*”. But the correct interpretation requires more investigation on this seal.





Figure 4: Top: The *Siddha Shila*, an icon of sacred place in Jain cosmology. It is a final destination of Arihnats/ tirthankas after their salvation, in the form of a boat structure showing the direction of Karmas through birds, model of IVC Mohenjo-Daro seal, 3000 BCE made employing either terracotta technique or carved on a red stone. Maritime Heritage Gallery, India National Museum, New Delhi. Complete indexed photo collection at WorldHistoryPics.com. Bottom: the recent picture of Siddha Shila of the modern era is shown for comparison. Note some differences, which require further investigation to prove the seal truly reflects the Siddha Shila.

Further, there are strong archeological and geographical evidences that farming during the Neolithic period spread from the Near East into north-west India, but there is also "good evidence for the local domestication of barley and the zebu cattle at Mehrgarh (Gangal et al., 2014). On the other hand, the Mehrgarh site "demonstrates that food production was an indigenous South Asian phenomenon" and that the data support interpretation of "the prehistoric urbanization and complex social organization in South Asia as based on indigenous, but not isolated, cultural developments" (Shaffer, Jim G., 1999). The cattle that are often portrayed on Indus seals are humped Indian bulls, which are similar to Zebu cattle. Zebu bull is still common in India, and in Africa. It is different from the European cattle, and had been originally domesticated on the Indian subcontinent, probably in the Baluchistan region of Pakistan (Gallego Romero, Irene; et al., 2011; Srinivasan, Doris, 1975). It should be mentioned that the bull is a logo/ symbol of the first tirthankar Shri Rishabhnaatha of Jain tradition (*cf.* Figure 2 and 3). Further, on the other hand, it has been widely established and known that Shri Rishabhnaatha, 1st tirthankar of Jainism, taught six professional techniques to the people as follows in the early Paleolithic era: (1) *Asi* (swordsmanship for protection), (2) *Masi* (writing skills), (3) *Krishi* (agriculture), (4) *Vidya* (knowledge), (5) *Vanijya* (trade and commerce) and (6) *Shilp* (crafts) (Jain, Champat Rai, 1929; Sangave, Vilas Adinath, 2001; Shah, Natubhai, 2004). Further, he is also credited with introducing *karma-bhumi* (the land and period for action) by founding arts and professions to enable householders to sustain themselves (Dundas, P., 2002; Jain, Champat Rai, 1929; Jain, Kailash Chand, 1991). Rishabhnaatha also invented and taught fire, cooking and all the skills needed for human beings to live. Shri Rishabhnaatha is said to have taught seventy-two skills and techniques to men and sixty-four to women (Dalal, Roshen, 2010). Further, the social system of marriage was also established by him after his marriage marked the precedence (Jaini, Padmanabh S., 2000). According to Paul Dundas (2002) Shri Rishabhnaatha is a spiritual, culture and technological hero of the current cosmological cycle. Therefore we may conclude that the agricultural evidences found at Mehargah and in other

regions of Indus Valley Civilization are socio-cultural continuation of knowledge based society of Jain tradition.

5.2 Śramaṇa Tradition across the Red Sea:

Recently, Dr. Rajmal Jain (2020) cites his discovery of many Jain temples in West Asian and African countries as well as Nigantha Tradition in South American countries that revealing the existence of Jainism dating back to more than 5000 years BCE. He claims finding of evidences of visit of Shri Rishabhdev and/ or his followers in different continents of the world to propagating *Śramaṇa culture* and *Nigantha tradition*, however, with different names according to regional language of the continents and suiting to the local folk. Shown in Figure 5 and 6 are the remnants of great temple of the Moon and associated evidences such as Abhishek (ablution/ anointment) kund, presently existing in the Tigray region of Ethiopia, The artifacts and other evidences reveal that this temple is of 8th tirthankar Shri Chandraprabhu.



Figure 5: Left: The great Moon Temple of Yeha, Tigray Region, Ethiopia. Front view of the entrance of the big campus of the temple. The one big hall comprising of both Garbhgraha and Mandapgraha. The tall stone strictures appear to be of Sabaeen tradition. Right: Ablution well (kund) to showering the Chandraprabhu according to Jain tradition.



Figure 6: Left: The icon of Sh. Chandraprabhu, almost 1200-700 BCE. During this era except Jainism no other religions was existing. Right: Ancient stone slabs of the temple on which Sabaean Inscription is written. The arrow marks the stone made *Diya Ghar* (lamp house).

Similarly, in the same Tigray region the temple of Almaqah exists since more than 3000 years before present. In Figure 7 is shown the *Abhishek Vedi* (Anointment altar) of the Almaqah temple. In fact the name of the temple is Addi Akaweh, perhaps, related with God Aadinath. The structure of Anointment altar is also made of stone and appears to be from Sabaean culture. For detailed description and various evidences obtained from West Asia and African countries the readers are suggested to read the article by Dr. Rajmal Jain on “**Exploring Śramaṇa Culture/ Jainism in the Tigray Region of Ethiopia**” published in this issue of Journal of Archaeology and Culture. It has been concluded in this article that the Śramaṇa culture was existing much long before the birth of Shri Parshwanath and Shri Mahāvīra in India as well as in the West Asia and Africa. The Śramaṇa culture was dominating and well organized tradition in the regions currently called as Iran, Israel, Palestine, Saudi Arabia, Yemen on one side, and the Ethiopia, Kenya, Egypt, Greece *etc.* on the other side of the Red Sea.



Figure 7: Left: The hexagonal shaped well carved and script written *Abhishek Vedi* (Anointment Altar) at Addi Akaweh temple of Almaqah. Right: Top view shows the location of the statue where Abhishek process was being conducted. The side arrow indicates script in Sabea language.

Dr. Rajmal Jain (2020) describes that the Indian scholars team observed the artifacts, analysed the iconography details, and archaeological, anthropological and historical evidences. The study unambiguously reveals that almost one milleneum BCE the Tigray region was largely dominated by the community of Śramaṇa culture, and the ruling kings of the empire were also from this community (priest-king). This may be further endorsed from the inscription written on the stele/ flagstone in Sabaean **Ge'ez**, language. He showed that the ancient South Semitic language of the East African came from the present Yemen and Saudi Arabia, the earlier Sabaean region. Many evidences were found to prove that the Tigray region was thickly populated and under dominance of Śramaṇa culture *viz.* the artifacts and archaeological evidences found at the Great Moon temple and the Almaqah temple, the monastery (Sant Bhavan) and the inscriptions found in the Aksum *etc.* The ethics and practices followed by Orthodox Christians as well as the discussions held with priests regarding this community further endorsed that Sabaean culture was either Śramaṇa culture or it was highly influenced by the presence of Śramaṇa community in the Tigray region. Most of the inscriptions on the stele/ flagstone are in Sabaean **Ge'ez** language, which is an ancient South Semitic language of the East African branch and came from the present Yemen and Saudi Arabia. Although we could not derive the exact translation of the script written on the flagstones but the process of understanding and learning the script is in well progress. However, it is very important to mention that the Jerusalem, the oldest city of the world, was either the head-quarter or the central place of Śramaṇa culture. Dr. Jain also showed that the Ten Commandments, also known as the Decalogue of current Orthodox Christians, are a set of philosophical principles relating to ethics and worship that played a fundamental role in the prehistoric or ancient religion of few thousands of years BCE, perhaps the Śramaṇa culture/ Jainism. In conclusion the study revealed that the Śramaṇa culture existed since several millenniums BCE in the continents on both sides of the Red Sea (*cf.* section 1).

5.3 Signatures of the Nirgrantha Tradition in South America:

It is widely known in the ancient history that Mesopotamia, Egypt, China, and India, gave rise to the first civilizations of mankind. However, very few are aware that at the same time, and even in some cases before these societies emerged, another great civilization had sprouted - **the Norte Chico civilization of Supe, Peru** – the first known civilization of the Americas. Their capital was the *Sacred City of Caral* – a 7000 year or older metropolis complete with complex agricultural practices, rich social and scientific culture, and monumental architecture, including six large pyramidal structures, stone and earthen platform mounds, temples, amphitheaters, sunken circular plazas, and residential areas (Jain, Rajmal, 2021). The

establishment of human groups in the **Andean region** of South America dates back to 10000 years BCE, although some investigations place their birth around four thousand years earlier. Early hunter-gatherer societies were progressing towards more complex structures on the basis of primitive agricultural activity (Jain Rajmal, 2021). A milestone in regional development is the establishment of the city of Caral, the oldest known city whose structure and dimensions account for important state and religious development with **Śramaṇa culture**, appears to be started by a king of six continents, perhaps, Rishbahdev or his follower (Jain, Rajmal, 2021).

The Caral or *Caral-Supe* civilization flourished in the north-central area of the present-day territory of Peru and came to have around 30 populated settlements. The most transcendental achievement of this culture was its architectural development, with monumental stone and clay buildings. The quality and the method used in their buildings gives a great account of the use of building techniques and the knowledge of arithmetic, geometry, and calculation. In addition, they did not neglect the aesthetics of their constructions, polishing the rocks for their best appearance and embellishing them with paintings made from stones, plants and ground flowers.

The Caral-Supe culture was pre-ceramist; it developed between 5000 and 1800 BC (Late Archaic), and existed before or alongside other early civilizations such as Egypt, India and Mesopotamia (For more details read Jain, Rajmal, 2021). The remains rescued in Caral and other settlements of the Supe valley, such as Ápero, Miraya, Lurihuasi and Chupacigarro, as well as Vichama in the valley of Huaura, have transformed the history of Peru, by showing that in the north-central area, a civilization was formed of an antiquity comparable to those of the ***Old Continent***. The most important legacy is the city of Caral, considered the oldest American city, its construction dates between 2627 and 2100 BCE, which highlights the absence of ceramic productions. It was discovered in 1905, its full name, *Caral-Supe*, is derived from the sacred city that is in the valley of Supe, in Lima. Among its varied structures and plazas stands the Great Pyramid. The city of Caral consists of a group of monumental buildings, with different ceremonial and administrative functions. Chronologically, it is the oldest settlement in the Americas, and perhaps in the world, that has these characteristics and therefore is considered the first city of the Americas.

According to Dr. Rajmal Jain (2021) the ***Sacred City of Caral*** is located at the beginning of the Lower Middle Valley area of the Supe Basin, 26 km from the pacific ocean coast and 350 meters above sea level, occupying an area of 66 hectares, in which two zones are distinguished: nuclear and marginal. In the nuclear zone, the buildings are divided into two sectors: the upper sector, which has the largest public and residential buildings, seven monumental buildings, two circular sunken plazas, two collective congregation spaces, and residential units for officials, as well as an extensive residential suite of specialists and servers. On the other hand, the lower sector has smaller buildings, such as the architectural complex of the Amphitheater, the Circular Altar building and a smaller residential complex. The marginal zone, located in the periphery, contains residences grouped and distributed, as an archipelago, along the alluvial terrace that borders the valley. Each public building was built in relation to a certain deity and astral position. In them, multifunctional activities were carried out on certain dates of the annual calendar.

Shown in Figure 9 are the pyramid type temples in the arid Supe Valley of the Caral site located 20 km from the Pacific Ocean, near Lima, Peru.



Figure 8: The Caral Pyramid structure temples in the Arid Supe Valley, some 20 km from the Pacific coast (*cf.* the text above).

The main temple complex is 150 meters long, 110 meters wide and 28 meters high. The date of its construction is unknown. Findings from our study suggest it was a gentle society, built on commerce and pleasure. No indications of warfare have been found at Caral: no battlements, no weapons and no mutilated bodies. This contrasts with the older civilization of Sechin Bajo where depictions of weapons are found. In one of the temples, researchers uncovered 32 flutes made of condor and pelican bones and 37 cornets of deer and llama bones. One find revealed the remains of a baby, wrapped and buried with a necklace made of stone beads (Shady, R. Haas, J. Creamer, W., 2001). Each temple was managed and maintained by the priest king under the guidance of nude monks. These temples were in pyramid shape and structure, and constructed in omni-directional system *i.e.* in the east-north-west-south directions. At the center of this large hill-lock type temple complex we found a big flagstone mounted, and the Indian Scholars team concluded that it may be a symbolic representation of *Manak stambh* (*cf.* Figure 12).

In view of aforesaid description and various archaeological evidences it appears that the Caral-Supe culture (~7000 years BCE) was, in fact, of the period of the *Nirgrantha Tradition*, a very primitive and ancient phase of Śramaṇ culture. The *Nigaṇṭha* (निगण्ठ) or Nīyaṇṭha or Nirgrantha refers to a Jain monk or ascetic who renounces remaining nude throughout the life. Nigantha is also discussed in Theravada glossary of Buddhism. Thus Pāli sources do not seem to bear trace of any malicious or derogatory interpretation of the term. The fact that *nigaṇṭha* is used as the normal designation of Jain ascetics in the oldest Jain sources (Śramaṇic poetry as well as disciplinary books) confirms its antiquity. The phonetic aspect of the word (*nigaṇṭha*, with a single -ga-, and the prefix *ni-* instead of *nir-*) are supported by Prakrit *īyaṇṭha* and also point to an old form.

The ablution or anointment of the statue is very historical in Śramaṇ culture irrespective to available infrastructure or facilities as may be observed in the Figure 9, which is the ablution well/ Abhishek kund. The statue must have been brought by the monk or priest and mounted at appropriate place inside the kund to conduct the process of the anointment. It is made of local stones and clay etc. It is being maintained by the live museum authorities at the Caral-Supe site near Lima, Peru. The various features of the ablution kund may be noted such as the circular shape, suitable location to mount the statue, the outlet etc. Shown in Figure 10 is the iconography of the intaglio engraving figures on the stones at the Caral-Supe site revealing various stages of renunciation of the *Nigaṇṭha* (निगण्ठ) monks' viz. meditation, kesh lonch (self-hair dressing), salenkhana, samadhi etc., which are the unambiguous evidences suggesting that the Caral-Supe civilization was basically a Nigantha tradition society.



Figure 9: The sacred ablution well/ Abhishek kund. The statue must have been brought by the monk or priest and mounted at appropriate place to conduct the process of the anointment. It is made of local stones and ceramic powder etc. It is being maintained by the live museum authorities at the Caral-Supe site near Lima, Peru. The various features of the ablution kund may be noted such as the circular shape, suitable location to mount the statue, the outlet etc.



Figure 10: The iconography of the intaglio engraving figures on the stones at the Caral-Supe site. Left – the figures reveal kesh lonch (self-hair dressing) and meditation (yoga); Right - figures showing all different activities of renunciation such as different types of Yogas, meditation, salenkhana, samadhi etc. of Nigantha Sadhus (monks).

Further, we found a very large compound with steps for seating of the monks and the folk to conduct ceremonies as shown in Figure 11. The circular square located in a depression of the land may be seen and this could be accessed by means of two great stairs. This place was also used for exchanges of products such as pumpkin, beans and peppers. The terraces located in an overlapping way, the people were concentrated on them to carry out their works. The central Staircase is the main access to ceremonial facilities. The Atrium was the ceremonial space of excellence, with a central celebration/oblation (यज्ञ) and staggered stools. The altar in quadrangular format, it had an underground ventilation duct. In one of the many venues the ceremonial rites were developed. It was adorned with niches. The west wing was a complex of large terraces that were accessed by a side staircase. The Fogón, an altar of the Sacred Fire was in an enclosure decorated with friezes and niches. There used burnt offerings as a means of communication with the gods (performing the Yagna). The celebration and ceremonies were being conducted in the presence of Chief of the monks and the priest. East side is the one in which more superposed terraces were concentrated, seven in total, with enclosures and stairs that connected them to each other.



Figure 11: Left: a very large compound with steps for seating of the monks and the folk to conduct ceremonies. The circular square may be seen with two stairs. This place was also used as rural market to exchange the products. The Atrium was the ceremonial space of excellence, with a central celebration/oblation (यज्ञ). Right: location of the oblation is visible at the center of the circular square. There used burnt offerings as a means of communication with the gods (performing the Yagna). The celebration and ceremonies were being conducted in the presence of monks and the priest.



Figure 12: Left – Seen in the front-line are the members of the Indian Scholars team: the author Dr. Rajmal Jain, Dr. Sneha Rani Jan and Dr. Bhagchand Bhaskar, Right – the flagstone, perhaps a symbolic representation of *Manak Stambh*, a popular known structure in front of the temples of Śramaṇa culture.

It was very interesting to note that people of few settlements became non-vegetarian and started eating fish and other animals around 2000-1500 BCE, while, on the contrary, many settlements continued to follow the Nigantha Tradition. It was also surprising to note that before the birth of last three tirthankas, the nude monks/ priests and even the folk of this Nigantha tradition were good scholars of mathematics and astronomy, which are the fundamental features of Jain/ Śramaṇa culture (*cf. Jain Agamas*). At the entrance gallery of the live museum of the Caral site itself the display exhibits reveal these features of cosmological knowledge as shown in Figure 13. The left and right figures of the top panel indicate the superb knowledge of constellations (nakshtras) and zodiacs (rashis), and similarly the bottom panel indicates their knowledge about the structure of Jambu-dweepa, currently known as galaxy, consisted of 7 sacred kshtras, and similar to Jambu-deepa there are 8 such continents (Jain, Rajmal and Jain, Anupam, 2017, Jain, Rajmal, 2019). We observed the structure like Jambu-dweepa made on the ground using stone pebbles and nails, which is similar to the structure of the modern galaxy. We found such structures made at many places at the Caral-Supe site.

5.3.1 Maya Civilization:

Further, very interestingly, another settlement of a civilization, known as Maya civilization evolved in the Mesoamerican region from the same *Archaic Period*, 7000-2000 BCE, when the hunter-gatherer culture began to cultivate crops such as maize, beans and other vegetables and the domestication of animals (most notably dogs and turkeys) and plants became widely practiced (*cf.* section 4, teachings of Shri Rishabhnaatha). The first villages of the region were established during this period which included sacred spots and temples dedicated to various gods. The villages excavated thus far are dated from 2000-1500 BCE. The **Maya** are an indigenous people of Mexico and Central America who have continuously inhabited the lands comprising modern-day Yucatan, Quintana Roo, Campeche, Tabasco, and Chiapas in Mexico and southward through Guatemala, Belize, El Salvador and Honduras. The designation *Maya* comes from the ancient Yucatan **city** of Mayapan, the last capital of a Mayan Kingdom in the Post-Classic Period. The Maya people refer to themselves by ethnicity and language bonds such as *Quiche* in the south or *Yucatec* in the north (though there are many others). The '*Mysterious Maya*' have intrigued the world since their 'discovery' in the 1840 but, in reality, much of the culture is not that mysterious when understood. Contrary to popular imagination, the Mayan did not vanish and the descendants of the people who built the great cities of Chichen Itza, Bonampak, Uxmal and Altun Ha still exist on the same lands their ancestors did and continue to practice, sometimes in a modified form, the same rituals which would be recognized by a native of the land few thousand years ago (Jain, Rajmal, 2021). We visited Guatemala and Mexico and talked to Mayan people and the discussions enabled us to conjecture that their ancestors and forefathers, perhaps, were from Śramaṇa culture and practiced the rituals of this tradition. For more details, we suggest readers to read the next article by Dr. Rajmal Jain (2021) to appear in the next issue of this journal.



Figure 13: Top panel – Recent artistic view of the figures made on the basis of observations of the celestial objects by the monks, and representing the shapes of constellations and zodiacs currently popular in the astronomy and astrology. Bottom panel – the figures of the Milky-way galaxy made of pebbles (left) and nails (right) which, perhaps, represent the Jambu-dweepa where our home (Earth) belongs.

The Maya civilization developed over time and during the *Zapotec* Period (600 BCE-800 CE), the region surrounding modern-day Oaxaca, the new cultural center now known as Monte Alban was founded which became the capital of the Zapotec kingdom. The Zapotecs were clearly influenced by or perhaps related to the Olmecs and, through them, some of the most important cultural elements of the region were disseminated such as **writing, art and craft, mathematics, astronomy and the development of the calendar**; all of which the Maya would refine in view of their original knowledge obtained from the Śramaṇa culture (*cf.* section 4). Maya civilization was originated from the Śramaṇa culture and people were following and practicing ethics of the same, which may be further endorsed from the architectural design of the temples appearing like *Samosharan* (pyramid). We observed such pyramid temples that have been constructed in Tikal in Guatemala and also in Mexico by Mayan. In Figure 14 we show

pyramid type *Samosharan* temples, which give us an impression of the talent and knowledge of the Śramaṇa culture of Mayan, and motivates to imagine that, perhaps, during their era they might have witnessed the salvation of Tirthankara. Readers may find more details in the forthcoming article of Dr. Rajmal Jain (2021) in this journal.



Figure 14: The pyramid structure like *Samosharan* temples still existing in Tikal, Guatemala, South America. Inside the temple there is a hall for meeting and discussions *etc.* The top of the building is area of the monk/ priest from where he was addressing to the large audience seating in the big ground. The temples are constructed facing to all four directions with a large ground for seating of the folk and animals. In front of each temple a flagstone, a symbolic representation of the *Manak Stambh* may be noted.

On the other hand, during the **Teotihuacan** Period (200-900 CE), after birth of Shri Parshwanatha and Shri Mahāvīra, the great city of Teotihuacan grew from a small village to a metropolis of enormous size and influence. Early on, Teotihuacan was a rival of another city called **Cuicuilco** but, when that community was destroyed by a volcano around 100 CE, Teotihuacan became dominant in the region. Archaeological evidence suggests that Teotihuacan was an important religious center which was devoted to the worship of a *Great Mother Goddess* and her consort the *Plumed Serpent*. The Plumed Serpent god Kukulcan (also known as Gucamatz) was the most popular deity among the Maya. We propose strongly that the Great Mother Goddess (serpent goddess) was, perhaps, *Padmawati*, and her consort *Dharanendra*, a serpent god, who saved 23rd Tirthankar Parshwanath from the wretched acts of Kamath. In Figure 15 we show the remnant statue of *Dharanendra* with spread his fangs all across the head currently located at Trikal in Guatemala. Like many of the cities which now lie in ruin throughout the southern Americas, Teotihuacan was abandoned sometime around 900 CE.

During exploratory visit of Indian team to Peru, Guatemala and Mexico during January 2020 met to Indian Ambassador in Peru and Guatemala as shown in Figure 16. During the visit to Shri Mandarapu Subbarayudu, Indian Ambassador in Peru, team members briefed the presentations made at the seminar organized jointly by All India Digamber Jain Mahasabha, New Delhi and The National University of San Marcos (UNMSM), Lima, Peru at the Dept. of Philosophy and Religion during 13-14 January 2020. On the other hand, Shri B.S. Mubarak, Indian Ambassador, Guatemala invited Dr. Rajmal Jain, author of this paper, to participate in the Republic-Day ceremony on 26 January 2020. Dr. Jain also briefed him about the purpose of visit and outcome of exploration of Jainism in Guatemala in context to Tikal temples and Maya civilization. Both ambassadors, Shri Mandarapu Subbarayudu and Shri Shri Mubarak, advised and motivated the Indian team to prepare a good project and visit for a longer period and more frequently to explore in depth.



Figure 15: The remnant statue of *Dharanendra* with spread of his fangs all across the head, currently located at Trikal in Guatemala. The statue is deteriorating because made of sandstone.



Figure 16: Left - The Indian Scholars team at the Indian Embassy to visit Ambassador Shri Mandarapu Subbarayudu and briefed him about the Seminar held at the Dept. of Philosophy and Religion, The National University of San Marcos, Lima, and the outcome of the visit of Caral-Supe site (*cf.* text above). Right – Shri B.S. Mubarak, Indian Ambassador, Guatemala invited Dr. Rajmal Jain (on left side), author of this paper, to participate in the Republic-Day ceremony on

26 January 2020. Dr. Jain also briefed him about the purpose of visit and outcome of exploration of Jainism in Guatemala in context to Tikal temples and Maya civilization.

6. Jainism in the Scientific Perspective:

It has been mentioned in several Jain canonical texts that Jainism is an eternal religion and has been existing since the beginningless time and will continue forever. In this context, and in the view of pre-history of Jainism in general and the earlier ten incarnation (Das Bhav) of Shri Rishbhanatha in particular (*cf.* section 2), we reviewed the antiquity of Jainism in the perspective of science.

- *Homo-sapiens* is a part of a group called hominids, which were the earliest humanlike creatures. Based on archaeological and anthropological evidence, we think that hominids diverged from other primates somewhere between 2.5 and 4 million years ago in eastern and southern Africa. Adventures discovery of *Luci* in Ethiopia, Africa is a great example of development of hominid, however, without brain (Jain, Rajmal, 2012). Though there was a degree of diversity among the hominid family, they all shared the trait of *bipedalism*, or the ability to walk upright on two legs (Strayer, Robert W. and Eric W. Nelson, 2016). However, in summary we may conclude that the *Homo sapiens*, the first modern humans, evolved from their early hominid predecessors between 200,000 and 300,000 years ago. They developed a capacity for language about 50,000 years ago. The first modern humans began moving outside of Africa starting about 70,000-100,000 years ago. Humans are the only known species to have successfully populated, adapted to, and significantly altered a wide variety of land regions across the world, resulting in profound historical and environmental impacts.

According to the **savannah hypothesis**, early tree-dwelling hominids may have been pushed out of their homes as environmental changes caused the forest regions to shrink and the size of the savannah expand. These changes, according to the savannah hypothesis, may have caused them to adapt to living on the ground and walking upright instead of climbing (*cf.* section 2). Hominids continued to evolve and develop unique characteristics. Their brain capacities increased, and approximately 2.3 million years ago, a hominid known as *Homo habilis* began to make and use simple tools. By a million years ago, some hominid species, particularly *Homo erectus*, began to migrate out of Africa and into Eurasia, where they began to make other advances like controlling fire (Buliet, Richard W. et. al., 2011).

Though there were once many kinds of hominids, only one remains: *Homo sapiens*. **Extinction** is a normal part of evolution, and scientists continue to theorize why other hominid species didn't survive. We do have some clues as to why some species were less successful at surviving than others, such as an inability to cope with competition for food, changes in climate, and volcanic eruptions (Spodek, Howard, 2006). Between 70,000 and 100,000 years ago, *Homo sapiens* began **migrating** from the African continent and populating parts of Europe and Asia. They reached the Australian continent in canoes sometime between 35,000 and 65,000 years ago. Scientists studying land masses and climate know that the Pleistocene Ice Age created a **land bridge** that connected Asia and North America (Alaska) over 13,000 years ago. A widely accepted migration theory is that people crossed this land bridge and eventually migrated into North and South America (Melissa Hogenboom, 2017). How were our ancestors able to achieve this feat, and why did they make the decision to leave their homes? The development of **language** around 50,000 years ago allowed people to make plans, solve problems, and organize effectively. We can't be sure of the exact reasons humans first migrated off of the African continent, but it was likely correlated with a depletion of resources (like food) in their regions and competition for those resources. Once humans were able to communicate these concerns and make plans, they could assess together whether the pressures in their current home outweighed the risk of leaving to find a new one (Bentley, Jerry H. et. al., 2015).

When humans migrated from Africa to colder climates, they made clothing out of animal skins and constructed fires to keep themselves warm; often, they burned fires continuously through the winter. Sophisticated weapons, such as spears and bows and arrows, allowed them to kill large mammals efficiently. Along with changing climates, these hunting methods contributed to the extinction of giant land mammals such as mammoths, giant kangaroos, and mastodons. Fewer giant mammals, in turn, limited hunters' available prey. In addition to hunting animals and killing them out of self-defense, humans began to use the earth's resources in new ways when they constructed semi-permanent **settlements**. Humans started shifting from nomadic lifestyles to fixed homes, using the natural resources there. Semi-permanent settlements would be the building-blocks of established communities and the development of agricultural practices (Bentley, Jerry H. et. al., 2015).

In view of the foregoing description, if we consider the first skilled human evolution between 2 and 4 lakhs years ago, and with significant talent between 1 and 2 lakhs years, and the language developed about 50,000 years ago then it would be helpful to comparing it with the

climate cycle of the Earth and Jain Kalchakra to estimate the period of Rishabhjnatha and his earlier ten incarnations (Das Bhav). Dr. Rajmal Jain (2012) cited a verse from Acharyashree Hemchandracharya as follows.

अह भगवं भवमहणो, पूव्वाणमणूणं सयसहस्सं ।
अणुपुव्वीं विहरीऊणं, पत्तो अट्ठावयं सेलं ॥433॥
अट्ठावयंमि सेले, चउदस भत्तेण सो महरिसीणं ।
दसहि सहस्सेहिं समं, निव्वाणमणुत्तरं पत्तो ॥434॥
निव्वाणं चिड्गागिई, जिणस्स इरवाग सेसयाणं च ।
सकहा थूभर जिणहरे, जायग तेणाहि अम्मिन्ति ॥435॥

अर्थात् संसार के दुःखों का अन्त करनेवाले भगवान ऋषभदेव संपूर्ण एक लाख पर्व तक पृथ्वी पर विहार करके अनुक्रम अष्टापद पर्वत के ऊपर पहुँचे । वहाँ छ उपवास के पश्चावत दस हजार मुनिगण के साथ निर्वाण को प्राप्त हुए। जहाँ भगवान ने निर्वाण प्राप्त किया था वहाँ देवो ने स्तूप बनाए और भरत चक्रवर्ती ने चौबीस तीर्थकरों के वर्ण एवं परिमाण के समान सपरिकर मूर्तियां स्थापित की और जिन मंदिर बनाया।

(Hemchandrasuri ji M.S ~ 1100AD)

The above verse suggests that Shri Rishabhjnatha travelled all over the Earth for a significantly large period of one lakh *purva*, and then he reached to Ashtapad for salvation. This indicates that his life span period was much longer and thus he would have born at least few tens of thousands of years before present (B.P). Therefore, his earlier ten incarnations might be few lakhs of years before present, however, cannot be beyond 4 lakhs of years because temperature growth was very slow, which did not allow to develop the brain of hominids. Thus considering the religious and scientific aspects together we analyzed the climate cycle of the Earth for the last ~420000 years B.P as shown in Figure 17.

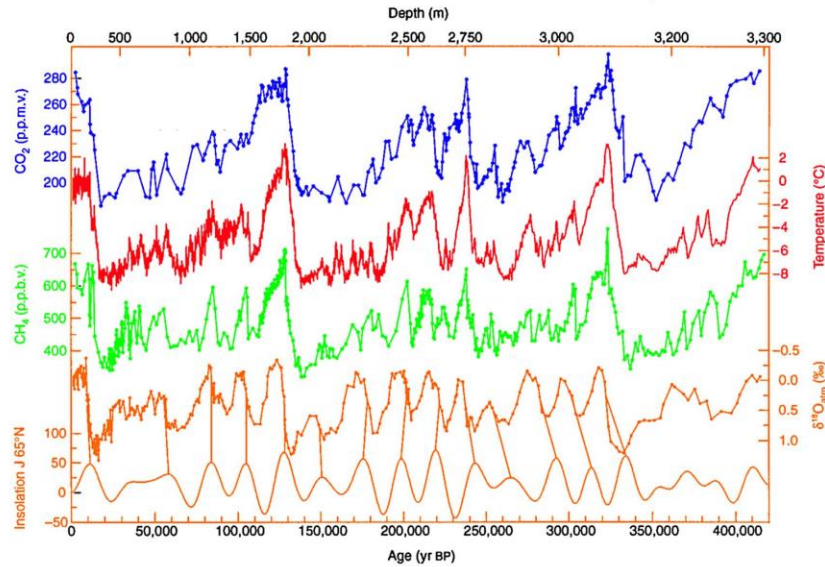


Figure 17: Variation of the Earth's temperature, atmospheric CO₂, O₂, methane (CH₄) and insolation over the past 420000 years. Note the 100000 years typical periodic variation in all the parameters. Whenever the temperature and CO₂ reach to minimum, about every 100000 years, the Earth is largely covered by the ice and the period is known as Last Glacial Maximum (LGM). The last LGM was around 23000 years ago before present.

In Figure 17 we may note the variation of the Earth's temperature, atmospheric CO₂, O₂, methane (CH₄) and insolation over the past 420000 years. Several analysis of ice cores have shown that the 100000 years typical periodic variation in all the parameters. Whenever the temperature, CO₂ and other proxies reach to minimum, about every 100000 years, the Earth is largely covered by the ice sheets and the period is known as Last Glacial Maximum (LGM). The last LGM was around 23000 years ago before present. The Earth's temperature variation, carbon-di-oxide and dust levels are derived as a function of time by the radio-active processing of the Vostok ice-core obtained by digging in the Antarctica (Andrey N. Salamatina et.al., 2004). The plots shown in Figure 18 are of the three parameters and, in fact, they reveal **Milankovitch cycles** that describe the collective effects of changes in the Earth's movements on its climate over few thousand years viz. ~100000 years of eccentricity variation; ~41000 years of axial tilt obliquity variation and ~ 23500 years of axial precession (Jain, Rajmal, 2012, 2019). The last LGM, around 23000 years before present, was extremely severe, and the Earth was significantly covered by the ice sheets.

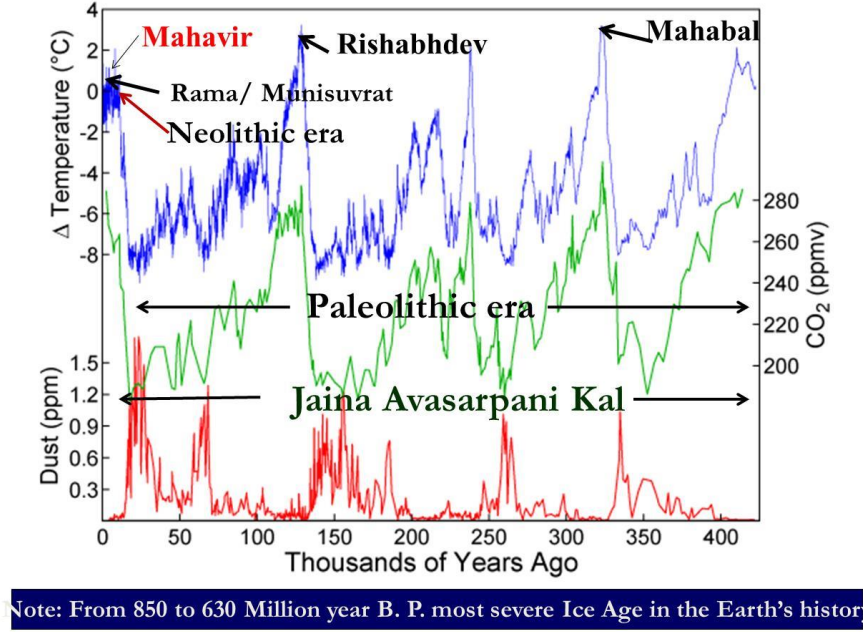


Figure 17: Variation of temperature, CO₂ and dust over the last 420000 years. The temperature and CO₂ reached to minimum after every 100000 years while many other excursions at the periodic interval of 41000 and 26000 years as well as of shorter periods of about 200 and 400 years of solar origins may also be noted. However, the dust levels go inversely because they expand after the volcano eruption, which launches the CO₂ emission. Corresponding period of Jain Kaal Chakra and birth of Shri Rishabhdev and his first incarnation Mahabal as well as for Shri Rama and Mahāvīra are also indicated by arrow.

It is obvious from the Figure 17 and 18 that the variation of temperature, CO₂ and dust is periodic and, in fact, it reveals the periods of Earth's motion known as **Milankovitch** cycles. It may be noted that over the last 420000 years, the Earth has observed four LGM separated by 100000 years. In addition, the Earth has also experienced many other periodic excursions of about 41000 and 26000 years as well as of shorter periods of about 200 and 400 years of solar origins. However, the dust levels go inversely because they expand after the volcano eruption, which enhances the CO₂ emission. We analyzed the temperature and CO₂ emission data in the light of Jain Kaal Chakra (*cf.* section 1) and the scientific data of human evolution periods over the last 400000 years in order to estimate the period of Shri Rishabhdev and his earlier first incarnation Mahabal as well as the periods of Shri Ram, Munisuvratnatha and Mahāvīra. However, error estimation may be of few hundreds of years. Such a comparative analysis revealed that, most likely, Shri Rishabhdev and corresponding first incarnation Mahabal born around 140000 and 329000 years before present respectively. The estimation appears to be reasonable in context to significant atmospheric temperature and CO₂ level required for the brain functioning and talent *etc.*, which has been described in Jain canonical texts for the talent of

Rishabhnaatha and his ten incarnations. It may be noted that the other eight incarnations (cf. section 2) might have born during the period between 329000 and 140000 years before present, however at the time of suitable temperature and other parameters. Perhaps each incarnation was separated by ~23500 years of axial tilt period and considering this period we may obtain 8 Bhav (incarnation) of Shri Rishabhnaatha.

Further, the pre-history of Jainism in view of the *Agamas* suggests that Shri **Vadrajung**, the 3rd incarnation of Rishabhnaatha, perhaps born around 280000 years before present, married with **Shrimati** and on the next day of his marriage visited the **Mahaput Jin Chaitalya** along with Shrimati in the afternoon time. They worshiped the **Jinendra Dev**, first performing ablution and then with **Asht-dravya** and other incense burners. The details of Shri Vajrajanga and his wife and their life span as well as the various religious events have been described in **Aadipurana (Mahapurana)** in the verses from 269-279 written by Acharya Jinasena and translated by Shri Pannal Lal Jain (Panna Lal Jain, 1928). Thus in the perspective of science, history, religion and anthropology we may conclude that the pre-history of Jainism and the ten incarnations of Shri Rishabhnaatha are a real and true descriptions that took place in the current **Awasarpani Kaal**.

The above may be further endorsed from the **Padmapurana** where it has been described that Prabhu **Shri Ram along with Sita and Lakshman**, after departure from Ayodhya for 14-years of **banishment**, first visited the Jain temple of Arahnaatha, 18th Tirthankara of Jainism, located at the shore of the **Saryu river**. The temple had three doors and all the folk of Ayodhya could reach up to second door and then they were expelled out from there by the guard/watchman. However, Shri Ram, Lakshman and Sita could access the third door and worshiped Arahnaatha with heart (man), speech (vachan) and body (kaya) and prayed for the blessings (Verses from 215-241, **Padmapurana**). This suggests that period of Ram was much after the period of tithankar Arahnaatha. Further, it has been cited many times that the 20th tirthankar **Munisuvratnatha** was contemporary of Shri Ram (Shah, Natubhai, 2004; Zvelebil, Kamil, 1992). This indicates that the period of Munisuvratnatha may be same as of Shri Ram. Mr. Pushkar Bhatangar employing precise Planetarium software calculated the birth time and date of Shri Ram to be 12:30 PM of 10 January 5114 BCE (**Birth date of Rama - HitXP; Lord Ram's date of birth revealed/ India News/ Zee News**). Thus period of Shri Munisuvratnatha is likely to be around 7135 years before present, which appears to be reasonable in view that 22nd tirthankar **Shri Neminatha** born during the period of his cousin **Shri Krishna**, whose date of birth has been calculated to be 18 July 3228 BCE and he died on 18 February 3102 BCE. The great mega Mahabharat war took place in Kurukshetra when Krishna was of 89 years old. This enables us to estimate the birth period of Shri Neminatha to be about 5249 years before present i.e. almost 1886 years after shri Munisuvratnatha. Shown in Figure 19 are the historical statues of Munisuvratnatha, Neminatha, Parshwanatha and Mahāvīra. The last two tirthankars are Parshwanatha and Mahāvīra. The Jain sources place Parshwanatha between 872 – 772 BC (Zimmer, Heinrich, 1953; Martin, Nancy M. and Runzo, Joseph, 2001), whereas historians consider that he lived in the 8th or 7th century BC (Dundas, Paul (2002, 1992). In fact,

Parshvanatha was born 273 years before Mahāvīra. He was the spiritual successor of 22nd tirthankara Neminath. He is popularly seen as a propagator and reviver of Jainism. Parshvanatha attained moksha on the Mount Sammeda (Madhuban, Jharkhand), popular as Parasnath hill in the Ganges basin, an important Jain pilgrimage site. His iconography is notable for the serpent hood over his head, and his worship often includes Dharanendra and Padmavati, highly important Devtā and Devī in Jainism (*cf.* section 5 – **Maya Civilization**). Shree Mahāvīra born in 599 BCE and attained moksha in 527 BCE. He was the spiritual successor of the 23rd Tirthankara Parshvanatha. Mahāvīra was born into a royal Jain family in Bihar, India. His mother's name was Trishala and his father's name was Siddhartha. They were lay devotees of Parshvanatha. Mahāvīra abandoned all worldly possessions at the age of about 30 years and left home in pursuit of spiritual awakening, becoming an ascetic. Mahāvīra practiced intense meditation and severe austerities for 12 and half years, after which he attained *Kevala Gyan* (omniscience). He preached for 30 years and attained Moksha (liberation) in the 6th century BCE.

Mahāvīra taught that observance of the vows of *ahimsa* (non-violence), *satya* (truth), *asteya* (non-stealing), *brahmacharya* (chastity), and *aparigraha* (non-attachment) are necessary for spiritual liberation. He taught the principles of *Anekantavada* (many-sided reality): *syadvada* and *nayavada*. Mahāvīra's teachings were compiled by Indrabhuti Gautama (his chief disciple) as the Jain Agamas.





Figure 19: Top left - The 6th century AD statue of Shree Munisuvratnatha preserved in the State Museum, Bhopal, Top right – 12th century AD statue of Shri Neminatha at Tirumalai, Tamilnadu. Bottom left – Statue of Shri Parshwanatha preserved at the Victoria and Albert Museum, 6th – 7th Century, and Bottom right - Rock-cut sculpture of Mahāvīra in Kalugumalai Jain Beds, 8th century AD.

The review of above description of scientific data revealing climate variation on the Earth and simultaneously occurred pre-historical religious and anthropological events in the light of Milankovitch cycle and Jain Kaal Chakra during the Paleolithic and Neolithic era (1-4 epoch of Awasarpani Kaal) suggest that the Śramaṇa culture and hence the Jain religion has been existing since the human evolution with talent. This further indicates that in every Awasarpani and Utsarpani cycle the 24 tirthankars take birth and guide for the welfare of the human society as well as to follow and practice the ethics of Jainism so as to protect the Earth and Cosmic order.

7. Conclusion:

We studied the antiquity of Jainism in the perspective of anthropology, philosophy, religion, history, archaeology and science and found that the Jainism truly exists since the human evolution with talent and started understanding, following and practicing its ethics, which are related to the Earth and Cosmic order. Various perspectives endorse the birth of tirthankaras in

the current Awasarpani cycle periodically, as well as propagation and dissemination of Śramaṇa culture, which kept the Jainism survive in spite of several attacks by invaders to demolish and destroy the Jainism literally, physically and psychologically. We found the Śramaṇa culture not only a historic but well propagated over the globe since several thousands of years, and its signatures still exist in all the six continents of the Earth. However, currently Jainism is at low-key because of significantly decreased population, threatening by other religions, encroachment of their sacred/ holy pilgrimage places and reducing renunciation and change of the agenda/ priorities of the monks etc. Nevertheless, in view of current global issues and challenges the Jainism is likely to be a dominant religion in near future.

Acknowledgement:

I humbly and sincerely offer my *Namostu* to Acharyashree Kanaknandi ji Gurudev for considering my request to discoursing lectures on the Shri Rishabhdev. I also humbly offer my *Namostu* to Munishree Amoghkirti ji Gurudev and express high regards for providing pre-historic facts with references. I express my sincere gratitude and respect to Late Shri Nirmal Kumar Ji Jain Sethi for his keen interest to publish the work on the Antiquity of Jainism. I say thank you to Prof. B. L. Sethi, Jaipur for sending the Aadipurana Granth, and to Dr. Neha Jain, USA for arranging discussions with Gurudev. Discussions with many scholars and friends are also humbly acknowledged.

References:

- Andrey N. Salamatin, Elena A. Tsyganova, Vladimir Ya. Lipenkov and Jean Robert Petit, 2004, *Annals of Glaciology* , Volume 39 , 2004 , pp. 283 – 292; DOI: <https://doi.org/10.3189/172756404781814023>
- Basham, A.L. (1951), *History and Doctrines of the Ajivikas – a Vanished Indian Religion*, Motilal Banarsidass, ISBN 978-8120812048, pp. 94–103
- Bentley, Jerry H. et. al., 2015, *Traditions and Encounters: A Global Perspective on the Past* (New York: McGraw-Hill Education, 2015), 8-10.
- Beverluis, Joel Diederik (2000), *Sourcebook of the World's Religions: An Interfaith Guide to Religion and Spirituality*, Novato, CA: New World Library, ISBN 1-57731-121-3
- Bhandarkar, D. R., 1989, "Some Aspects of Ancient Indian Culture" Asian Educational Services 118 pages ISBN 8120604571 p. 80-81
- Bhatt, Sonali Marwaha, 2006, "Colors of Truth: Religion, Self and Emotions: Perspectives of Hinduism, Buddhism, Jainism, Zoroastrianism, Islam, Sikhism, and Contemporary Psychology", Concept Publishing Company. pp. 97–99. ISBN 978-8180692680

Bloomfield, Maurice (1906), *A Vedic Concordance: Being an Alphabetic Index to Every Line of Every Stanza of the Published Vedic Literature and to the Liturgical Formulas Thereof*, Harvard University Press

Bilimoria, Puruṣottama; Prabhu, Joseph; Sharma, Renuka M. (2007), *Indian Ethics: Classical traditions and contemporary challenges*, **1**, Ashgate Publishing Ltd, ISBN 978-0-7546-3301-3

Bulliet, Richard W. et. al., 2011 : *The Earth and its Peoples: A Global History* (Boston, Wadsworth, Cengage Learning, 2011), 4-6.

Chandler, Graham (September–October 1999). "Traders of the Plain". *Saudi Aramco World*: 34–42. Archived from the original on 18 February 2007. Retrieved 11 February 2007.

Dalal, Roshen (2010), *Hinduism: An Alphabetical Guide*, Penguin Books, p. 311, ISBN 978-0-14-341421-6

Dundas, Paul (2002) [1992], *The Jains* (Second ed.), London and New York City: Routledge, ISBN 0-415-26605-X

Dyson, Tim, 2018, “A Population History of India: From the First Modern People to the Present Day”, Oxford University Press. ISBN 978-0-19-882905-8.

Flood, Gavin D. 1996, “An Introduction to Hinduism”, Cambridge University Press

Flood, Gavin. Olivelle, Patrick. 2003. *The Blackwell Companion to Hinduism*. Malden: Blackwell. pp. 273–74.

Forlong, J. G. R., 1897, republished 2010, Kessinger Publishing
ISBN 116922816X (ISBN13: 97811692

Gangal, Kavita; Sarson, Graeme R.; Shukurov, Anvar, 2014, "The Near-Eastern roots of the Neolithic in South Asia", *PLOS ONE*. **9** (5).e95714. Bibcode:2014PLoSO...995714G. doi:10.1371/journal.pone.0095714. PMC 4012948. PMID 24806472.

Gallego Romero, Irene; et al. (2011). "Herders of Indian and European Cattle Share their Predominant Allele for Lactase Persistence". *Mol. Biol. Evol.* **29** (1): 249–260. doi:10.1093/molbev/msr190. PMID 21836184.

Ghurye, G. S. 1952, Ascetic Origins, *Sociological Bulletin*, Vol. 1, No. 2, pp. 162–184

Greek historian Herodotus *Encyclopaedia Britannica*, 11th Edition, Vol.XV. Page 128, denotes the nude Jain recluses.

Ghurye, G. S., 1952, "Ascetic Origins" *Sociological Bulletin*. **1** (2), 162184. doi:10.1177/0038022919520206. JSTOR 42864485. S2CID 220049343

Guseva, N.R., 1971, *Jainism*, Sindhu Publications Private Limite, Bombay

Habib, Irfan, 2015, “*The Indus Civilization*”. Tulika Books. ISBN 978-93-82381-53-2.

Hirst, K. Kris, 2005, [Updated May 30, 2019]. "Mehrgarh, Pakistan and Life in the Indus Valley Before Harappa".

Institute of Indic Studies, Kurukshetra University (1982). *Prāci-jyotī: digest of Indological studies*, Volumes 14–15. Kurukshetra University. pp. 247–249.

Jacobi, Hermann, 1968, *Jaina Sutras*, Motilal Banarsidass

Jacobi Herman, 1908-1927, “Jainism IN Encyclopedia of Religion and Ethics”, Volume 7, James Hastings (ed.) page 465

Jain, Champat Rai, 1929, *Risabha Deva – The Founder of Jainism*, Allahabad: The Indian Press Limited, © This article incorporates text from this source, which is in the public domain.

Jain, Kailash Chand, 1991, *Lord Mahāvīraa and his times*, Motilal Banarsidass, ISBN 978-81-208-0805-8

Jain, Rajmal, 2012, “New Techniques to Discover Ashtapad Palace – Temple”, Shri Ashtapad Maha Tirth II, Ashtapad Research International Foundation, New York, p. 17-40

Jain, Rajmal and Jain, Anupam, 2017, “***Jain Units of Space and Time***”, In monograph – Scientific perspectives of Jainism, eds. Samani Chaitanya Prajna, Narendra Bhandari, Narayan Lal Kachhara; Jain Vishwa Bharti Institute, Ladanun, pp. 610

Jain, Rajmal, 2019, “Discovery of Lost II - Reminiscence of lost measures of space and time and their relation to modern science”, Journal of Archaeology and Culture, Vol. 6, pp. 5-31, ISSN: 2347-7092

Jain, Rajmal, 2020, “Discovery of Lost III - Exploring Śramaṇa Culture/ Jainism in the Tigray Region of Ethiopia”, Journal of Archaeology and Culture, Vol. 7,

Jain, Rajmal, 2021, “Discovery of Lost IV - Śramaṇa Culture/ Nigantha Tradition in South America”, in preparation for publication in Journal of Archaeology and Culture, Vol. 8,

Jaini, Padmanabh S, 2000, *Collected papers on Jaina Studies*, Motilal Banarsidass, ISBN 978-8120816916

Jaini, Padmanabh S, 2001, *Collected papers on Buddhist Studies*, Motilal Banarsidass, ISBN 978-8120817760

Jambuvijaya, Muni, 2002, Piotr Balcerowicz & Marek Mejer (ed.), *Essays in Jaina Philosophy and Religion*, Motilal Banarsidass, ISBN 81-208-1977-2

James G. Lochtefeld, 2002, "The Illustrated Encyclopedia of Hinduism": N–Z, Volume 2, The Rosen Publishing Group, p. 639, ISBN 978-0823922871.

Jarrige, Jean-Francois, 2008, "Mehrgarh Neolithic" (PDF). *Pragdhara*. International Seminar on the First Farmers in Global Perspective – Lucknow, India – 18–20 January 2006. **18**. pp. 136–154.

Jambuvijaya, Muni (2002), Piotr Balcerowicz & Marek Mejer (ed.), *Essays in Jaina Philosophy and Religion*, Motilal Banarsidass, ISBN 81-208-1977-2

Johnson, Helen., (2009) [1931], Muni Samvegashvijay Maharaj (ed.), *Trisastiśālākāpurusacaritra of Hemacandra: The Jain Saga*, Part III, Baroda: Oriental Institute, ISBN 978-81-908157-0-3

Jones, Constance; Ryan, James D. (2007), *Encyclopedia of Hinduism*, Infobase Publishing, ISBN 978-0-8160-5458-9

Jotiya, Dhirasekera, 2007, Buddhist monastic discipline. Buddhist Cultural Centre

Kuiper, Kathleen (2010). *The Culture of India*. Rosen Publishing Group. p. 150. ISBN 9781615301492.

Martin, Nancy M.; Runzo, Joseph, 2001, *Ethics in the World Religions*, One world Publications, ISBN 978-1-85168-247-8

Masih, Y. (29 August 2000), *A Comparative Study of Religions*, Motilal Banarsidass Publ. – via Google Books

Max Muller, 1884, Brihadaranyaka Upanishad 4.3.22 original at The Clarendon Press, Oxford University Press, p. 169

McEvelley, Thomas, 2002, "The Shape of Ancient Thought, Allworth Communications", p. 335. ISBN 1581152035

McIntosh, Jane, 2008 *The Ancient Indus Valley: New Perspectives*. ABC-Clío. ISBN 978-1-57607-907-2.

Melissa Hogenboom, 2017)"The first people who populated the Americas", BBC Earth, 2017.

Monier Monier-Williams, श्रमण śramaṇa, Sanskrit-English Dictionary, Oxford University Press, p. 1096

Moore, G. F., 1913, *History of religions, Volume I: China, Japan, Egypt, Babylonia, Assyria, India, Persia, Greece, Rome*. The International Theological Library. Edinburgh: T & T Clark. OCLC 314138945. Vol. II, 1919.

Olivelle, Patrick, 1993, "*The Āśrama System: The History and Hermeneutics of a Religious Institution*", Oxford University Press. pp. 11–16. ISBN 978-0195344783.

Pande, Govind, 1957, "Studies in the Origins of Buddhism", Motilal Banarsidass (Reprint: 1995), p. 353, ISBN 978-81-208-1016-7

ऋग्वेदः सूक्तं १०.१६६

Shah, Natubhai, 2004, [First published in 1998], *Jainism: The World of Conquerors, I*, Motilal Banarsidass, ISBN 81-208-1938-1

Spodek, Howard, 2006: *The World's History*, New Jersey: Pearson, p. 5-9.

Sangave, Vilas Adinath, 2001, *Facets of Jainology: Selected Research Papers on Jain Society, Religion, and Culture*, Mumbai: Popular Prakashan, ISBN 978-81-7154-839-2

Shaffer, Jim G. 1999, "Migration, Philology and South Asian Archaeology". In Bronkhorst; Deshpande (eds.). *Aryan and Non-Aryan in South Asia*. Cambridge: Harvard University, Dept. of Sanskrit and Indian Studies. ISBN 978-1-888789-04-1.

Sangave, Vilas Adinath, 2001, *Facets of Jainology: Selected Research Papers on Jain Society, Religion, and Culture*, Mumbai: Popular Prakashan, ISBN 978-81-7154-839-2

1. Strayer, Robert W. and Eric W. Nelson, 2016, *Ways of the World: a Global History* (New York: Bedford/St. Martin's, 2016), 3-4.

Sangave, Vilas Adinath, 2001, *Facets of Jainology: Selected Research Papers on Jain Society, Religion, and Culture*, Mumbai: Popular prakashan, ISBN 81-7154-839-3

Shah, Natubhai, 2004, [First published in 1998], *Jainism: The World of Conquerors, I*, Motilal Banarsidass, ISBN 81-208-1938-1

Shults, Brett, 2016, "A Note on Śramaṇa in Vedic Texts." *Journal of the Oxford Centre for Buddhist Studies* p. 10.

Shady, R. Haas, J. Creamer, W., 2001, "Dating Caral, a Pre-ceramic Site in the Supe Valley on the Central Coast of Peru", *Science*, 292:723-726. doi:10.1126/science.1059519 PMID 11326098 ncbi.nlm.nih.gov

Scharlemann, Robert P., 1985, "Naming God, the contemporary discussion series. Paragon House. pp. 106–109. ISBN 978-0913757222.

Singh, Sakshi; et al., 2016,. "Dissecting the influence of Neolithic demic diffusion on Indian Y-chromosome pool through J2-M172 haplogroup", *Scientific Reports*. **6**. 19157. Bibcode:2016NatSR..619157S. doi: 10.1038/srep19157. PMC 4709632. PMID 26754573.

Samuel, 2008, p. 8; Quote: such (yogic) practices developed in the same ascetic circles as the early Śramaṇa movements (Buddhists, Jainas and Ajivikas), probably in around the sixth or fifth century BCE.

Shrotri (trans.), Delhi: Motilal Banarsidass (Reprinted: 1999), ISBN 81-208-1376-6

Srinivasan, Doris, 1975, "The so-called Proto-Śiva seal from Mohenjo-Daro: An iconological assessment". *Archives of Asian Art*. **29**: 47–58. JSTOR 20062578.

Svarghese, Alexander P. 2008, "*India: History, Religion, Vision And Contribution To The World*. pp. 259–60.

von Glasenapp, Helmuth (1925), *Jainism: An Indian Religion of Salvation* [*Der Jainismus: Eine Indische Erlosungsreligion*], Shridhar B. Shrotri (trans.), Delhi: Motilal Banarsidass (Reprinted: 1999), ISBN 81-208-1376-6

Wright, Rita P, 2010, "The Ancient Indus: Urbanism Economy and Society, Case Studies in Early Societies, Cambridge University Press,

Zvelebil, Kamil (1992), *Companion Studies to the History of Tamil Literature*, Netherlands, ISBN 90-04-09365-6

Zimmer, Heinrich (1953) [April 1952], Campbell, Joseph (ed.), *Philosophies Of India*, London, E.C. 4: Routledge & Kegan Paul Ltd, ISBN 978-81-208-0739-6

ICON

Journal of Archaeology and Culture

Volume 7

2020

Editor in Chief

AMIYA CHANDRA

Editor

BRIJESH RAWAT

Associate Editor

JAGPAL SINGH

Special Editors

PRANAB K. CHATTOPADHYAY

**Wakankar Rock Art and Heritage Welfare Society
Bhopal**

© Wakankar Rock Art and Heritage Welfare Society, Bhopal.

The Publication of this Journal is Financed by the Indian Council of Historical Research, New Delhi.

Volume 7, 2020

Price : ₹ 2500/- (India) Library
US \$ 100 (Other countries)
Individual ₹ 1500/-

ICON is published annually. It is an International Peer Review referral Journal.

Cover : Yakshi Ambika, Gwalior

Back : Symbol of ICON

The views expressed in the articles by the authors are their own and the editorial board has no concern with them.

Published by : Wakankar Rock Art and Heritage Welfare Society, Bhopal

E-mail: iconjournal2014@gmail.com • Mobile: +919532258847

Website : www.iconjac.org

Printed by : Research India Press, E-6/34, 1st Floor, Sangam Vihar

New Delhi – 110062 (INDIA) • E-mail: researchindiapress@gmail.com

Designed by : Ganga Ram Sharma

ICON

Journal of Archaeology and Culture

Volume 7 2020

ADVISORY BOARD

- | | | |
|--------------------------------|---|---|
| Dr. Narayan Vyas | : | Ex-President, Wakankar, Rock Art and Heritage Welfare Society, Bhopal, Madhya Pradesh, India. |
| Dr. B. R. Mani | : | Director General, National, Museum, New Delhi India. |
| Prof. H. S. Jha | : | Professor and Head Department of Sociology and Social Science, Dr. Shakuntla Misra National Rehabilitation, University, Lucknow Uttar Pradesh, India. |
| Dr. Sanjay Kumar Manjul | : | Joint Director General, Archaeological Survey of India, New Delhi, India. |
| Prof. Ajit Kumar | : | Professor, Department of Archaeology Kerala University, Trivendram, Kerala, India. |
| Prof. I. S. Vishwakarma | : | Professor, Department of Ancient Indian History Culture and Archaeology, Deendayal Upadhyay Gorakhpur University, Gorakhpur, Uttar Pradesh India. |
| Dr. Sanjib Kumar Singh | : | Archaeologist and Museologist, Department of Publication, National Museum, New Delhi, India. |

ICON

Journal of Archaeology and Culture

Volume 7 2020

EDITORIAL BOARD

- Prof. K.K. Thaplyal** : Ex. Head, Department of Ancient Indian History Culture and Archaeology, University of Lucknow, India.
- Prof. J. N. Pal** : Ex. Head, Department of Ancient History, Culture and Archaeology, University of Allahabad, Prayagraj, Uttar Pradesh, India.
- Prof. Vasant Shinde** : Vice-Chancellor, Deccan College Post Graduate and Research Institute, Pune, India.
- Prof. Anura Manatunga** : Director, Centre for Asian Studies, University of Kelaniya, Sri Lanka.
- Prof. Y. S. Alone** : Department of Visual Studies, Jawahar Lal Nehru University, New Delhi, India.
- Prof. Bharat Dahiya** : Senior Advisor, Chulalongkorn University, Bangkok, Thailand.

EDITORS

- Dr. Amiya Chandra** : President, Wakankar Rock Art and Heritage Welfare Society, Bhopal, Madhya Pradesh, India.
- Dr. Brijesh Rawat** : Department of History, Dr. Shakuntala Misra National Rehabilitation University, Lucknow Uttar Pradesh, India.
- Dr. Jagpal Singh** : The Institute of Archaeology, The Hebrew University of Jerusalem, Israel.
- Dr. Pranab K. Chattopadhyay** : Archaeometallurgist, Kolkata, West Bengal, India.

ICON

Journal of Archaeology and Culture

Volume 7 2020

CONTENTS

Obituary

Editorial

RESEARCH PAPER

- Pre historic Landscape of Assam and Meghalaya 1-13
Nilkamal Singha and O. Ranjit Singh
- Prehistoric Rock Paintings of Usrar, Singhpur, district Satna, 15-23
North Central India: A Preliminary Investigation and Analysis.
Pushpendra Kumar Nandan, Praveen Kumar and Yogita Baviskar
- Archaeological Study to Infer the Linkage in Between Kashmir Neolithic and 25-36
Harappan Civilization
Naheed Ahmed and Yogambar Singh Farswan
- Archaeology of Nātha *Sampradāya* in Pune District of Maharashtra 37-45
Vijay Sarde
- Excavating a Brick-Built Wharf at Pakkakot: An Unique Evidence of 47-54
Existence of Riverine Navigation in Early Historic Period
Sita Ram Dubey and Santosh Kumar Singh
- कम्बोडिया का पुरातत्त्व: एक नवीन विमर्श 55-63
बृजेश रावत
- Archaeological Significance of District Basti, Uttar Pradesh 65-74
Sandeep Kumar Chaudhary and Durgesh Kumar Srivastava
- Prehistory of Alwar District, Rajasthan 75-95
Vineet Godhal

| | |
|--|---------|
| An Overview of Chariot Depicted in Rock Paintings of Chalcolithic Period in Central India Ashish S. Shende | 97-103 |
| Critical Analysis of Rock Paintings in Central Chhattisgarh Region Shambhoo Nath Yadav and Md. Zakir Khan | 105-113 |
| Discovery of Lost - III: Exploring Śramaṇa Culture in the Tigray Region of Ethiopia Rajmal Jain | 115-135 |
| The History and Origin of Mirrors in Harappan Southeast Asia: Technology Revisited Pranab K. Chattopadhyay | 137-150 |
| A Study of Urbanization in Early Medieval North India: An Archaeological Overview (600 A.D -1200 A.D.) (With Special Reference to Siyadoni and Ahar Stone Inscriptions) Santosh Kumar Singh | 151-162 |
| Notable Stone Antiquities from Kolhua Excavations (Year 1989-93) Jalaj Kumar Tiwari | 163-167 |
| अहिच्छत्र एवं उसकी पुरासम्पदा रत्ना सिंह | 169-176 |
| An Analysis of the <i>Ananthashayana</i> Series Coins of Venad Dynasty from St. Thomas Fort, Thangassery, Kollam District, Kerala Ranimole S.J., Vinuraj B. and Aswani O.K. | 177-181 |
| Hypothetical observation of Wine use in Early Historical Sanghol Ardhendu Ray | 183-190 |
| छत्तीसगढ़ की पार्वती प्रतिमाओं का अध्ययन कामता प्रसाद वर्मा एवं बृजेश रावत | 191-198 |
| Depiction of Power in the Jain Art and Architecture of Sravanbelgola Varsha Rani | 199-213 |
| Some Sculptures of Yakshi Ambika from Gwalior Region Smriti Pathak and S.K. Dwivedi | 215-223 |
| Evolution of <i>Gurdwara</i> and Socio-Religious contributions towards the Sikh Community Amir Ali, Muhammad Hameed and Mahboob Hussain | 225-230 |
| Ideology, Power and Conquests: Representation of South Asia in European Cartography Ravindra Kumar, Deepak Kumar and Neelkamal Singha | 231-240 |
| Battles and Sieges in Historical Cartography of India Devendra Gupta and Deepak Kumar | 241-246 |
| Interpreting Pichhvai Tradition of Miniature Paintings and its Artists Parul Sharma and S.K. Dwivedi | 247-258 |

| | |
|---|---------|
| मिथिलांचल में सांस्कृतिक अरिपन का महत्व <i>अमरजीत कुमार एवं मनोज कुमार टेलर</i> | 259–266 |
| Conservation Challenges of Monuments in the Hills of Uttarakhand <i>Syed Jamal Hasan</i> | 267-273 |
| Exploratory Data Analysis of Sculptures and other Artifacts of the Gupta Period Exhibited in the Pāñchal Museum <i>Saroj Kumari, Surabhi Srivastava and Archit Srivastava</i> | 275-296 |
| Plates | 297-349 |

OBITUARY



Shri Nirmal Kumar Jain Sethi
(08. 07. 1938 – 27. 04. 2021)

On 27 April 2021 Shri Nirmal Kumar Jain (Sethi) passed away at the age of 83 at Teerthanker Mahaveer hospital & Research Center of Teerthanker Mahaveer University (TMU), Moradabad (UP). He was born on 08 July 1938 in Tinsukia, Assam into the Jain family following and practicing Śramaṇa tradition. He was a wonderful son of Late Shri Harak Chand Jain Sethi having great faith in Jainism, Saints and Śramaṇa culture from the childhood. He did B. Com from St. Xaviers College, Kolkata University. He started his career in business as an Industrialist by establishing one of its kinds Cold Storage in 1962 in Tinsukia. However, from inside he was a great academician, and had been reading books on philosophy, history, religion and archaeology etc., and thereby he was highly inclined to spiritual life. He had been visiting holy places of all religions in general and Jainism in particular all over the globe. He was also devotee of many Jain monks and Acharyas, and always ready to rendering services to them. Looking at his faith and promotion of philosophy of Śramaṇa tradition, willingness for protection of heritage and restoration of ancient Jain temples, he was elected as President of *Shre Bharatvarshiya Digamber Jain Mahasabh* on 3 January 1981 in the annual convention held in Kota. It is to be noted with proud that “Shree Bharatvarshiya Digamber Jain Mahasabha (SBDJM)” was formed before

freedom of India in 1895 and is only representative organization of Digamber Jain community. Mr. Sethi dedicated himself to the services of religious and ascetic activities as well as to protect heritage of Jains, and, in this context, he was continuously being persuaded and requested by our society for his nomination as President of SBDJM and had served for 40 years until his salvation on 27 April 2021.

Mr Nirmal Kumar Jain Sethi as a president of SBDJM visited personally almost all states of India and promoted construction of new temples and restoration of antique and old pilgrim/ holy places such as Muktagiri and Mangitungi Siddh kshetra, Nemgiri, Anjangiri, kanakgiri, Gopachal Arihantgiri, Sonagir, Ayodhya, Jambudwip, Hastinapur etc., and ensured to retain original structure. He himself contributed significant amount for this noble cause. Mr. Sethi focused on *Dharm Savrakshini Mahasabha*, a unit of SBDJM, in order to motivate and practicing *Jain Vidya* among Jains of India and abroad. Further, in order to speed up the restoration of Jain pilgrim/ holy places he formed in 1997 *Tirth Savrakshni Mahasabha* under SBDJM. Under his supervision more than 350 temples and pious/ holy places were renovated. He was a very strict follower of Ahimsa and keen that youth of India should practice it. He formed *Yuva Jain Mahasabha* and *Mahila Jain Mahasabha* to promote *Śramaṇa Culture* all over the globe because he was of the opinion that this tradition can truly bring the peace in the world. Mr. Sethi, on the other hand, was fascinated by literature of Jainism, called *Agam* canonical texts, and in order to unveil the hidden knowledge into them he formed *Shrut Samvardhini Mahasabha* in 2004, another unit of SBDJM. He promoted publication of various Jain canonical texts, books and Granths written by Acharyas and scholars. Furthermore, through SBDJM also he started regular publications to keep interaction and disseminate knowledge of Jainism to the folk all over India and abroad. More popular publications are the books and periodicals viz. Jain Gazette (weekly), Pracheen Teerth Jirnodhaar (monthly), Shrut Samvardhini (monthly), Jain Mahiladarsh (monthly), He also published numerous books on religious, archaeological and educational aspects in various languages.

Mr. Sethi was highly interested in the history and antiquity of Śramaṇa Culture and in this context he was probing evidences in various parts of India as well as in many other countries. He was associated and worked with many archaeologists, scientists, historians and Jain scholars, and collected evidences to explore the antiquity of Śramaṇa Tradition. In this respect, he formed a team of scholars of various disciplines and visited more than 15 countries viz. Cambodia, Indonesia, Thailand, Sri Lanka, Jakarta, China, Dubai, Ethiopia, Kenya, UK, USA, Germany, Greece, Peru, Guatemala, Mexico *etc.* to explore the Śramaṇa Tradition in the world. He was very enthusiastic and with associated colleagues made contacts with well-known universities in the aforesaid countries and organized international seminars/ symposiums on the Śramaṇa Culture, Nirgranth Tradition and global peace *etc.* Good publications turned out from this endeavor of him. Various archaeological and historical evidences from the international exploration enabled to discover the Chandraprabhu and Aadinath temples in the Tigray region of Ethiopia, and similarly signatures of Śramaṇaculture in South America in general and in Peru, Guatemala and Mexico in particular. His gracing guidance established that the South Asia and the region up to Greece, Saudi Arab, Yemen *etc.* were thickly populated by Śramaṇas and their traditions.

Mr. Nirmal Kumar Sethi was honored and felicitated with many titles such as Shrivak Ratna Mani, Samaj Ratna, Tirtha Bhakta, Muni Bhakta *etc.* by various Jain Samaj and organizations.

The Minorities Commission of India honored him with the *Life Time Award*. In 1984, he organized a seminar on *Non-Violence: Jeev Daya and Vegetarianism*. In 1985, he organized *Vishwa Jain Conference* in Delhi. He was trustee of SBDJM Charitable Trust and graced many other Jain organizations such as: Shri Digamber Jain Kundalpur (Vaishali) Tirthakshetra Committee, Bihar; Shri Gopal Digamber Jain Sidhant Sanskrit Mahavidyalay, MP. In 2006 he was nominated as convener of *Gommateshwara Bhagawan Sri Bahubali Swami Maha-Mastakabhishek Mahotsava Samithi*, Shravanbelagola. He was member of Governing Council and Chief Patron of Bhagwan Mahavir Memorial Samiti, New Delhi. Mr. Sethi was Patron of Shri Digamber Jain Ayodhya Tirthakshetra Committee, Raiganj, Ayodhya, U.P. He was Managing Trustee of Sethi Parmarthik Trust, Guwahati, and Harakchand Nirmal Kumar Jain Charitable Trust, Sitapur, U.P.

Shri Nirmal Kumar Jain Sethi left a lasting imprint on the *Śramaṇa* Tradition in India and over the globe from the impetus he received from great Acharyas and monks as well as from his father the late Shri Harak Chand Jain Sethi. He was practicing Jainism in his day to day life and thereby, in fact, he was a true saint of present time. His biography upholds him a legendary of India.

PROF. RAJMAL JAIN, AHMEDABAD

EDITORIAL

This Seventh Issue of **ICON** is important for two specific reasons. First reason is that this Journal is being published in remembrance of Late Sri Nirmal Kumar Jain Sethi (Babu ji), President, Sri Bharat Varshiye Digambar Jain Mahasabha, New Delhi, who has the profound knowledge of Jain Culture and Archaeology, and the excellent work done by him in the said field.

Shri Sethi, for the research in Jain Culture and Archaeology organized seminars, conferences, symposiums not only in the country but also abroad in the countries like Sri Lanka, Ethiopia, Greece, Peru etc. He sent the groups of scholars of History and Archaeology to foreign countries like Sri Lanka, Myanmar, Cambodia, Thailand, Vietnam, Ethiopia, Greece, Peru, Mexico etc., in search of the remains of Jain Archaeology. The name of famous scholars like K.N. Dixit, Vasant Shinde, Rajmal Jain, Narendra Kumar Jain, Sanghmitra, Bhag Chand Jain, Brijesh Rawat formed the part of group expedition. There is no hesitation in saying that Shri Sethi was completely devoted to Jainism, No other name is coming to mind, who could be remembered, who has done so much of successful efforts for the promotion and research of Jainism, culture and archaeology as much as has done by him in this century. Hence by giving tribute to such a devout leader the Journal itself is feeling honoured.

The second important reason is that this Journal has become dear to Indian Council of Historical Research, New Delhi because due to the continuous publication of its abstract research papers, the prestigious institution has decided to provide important financial support for its publication. After receiving financial support from this distinguished institution of the Government of India, now this journal has joined some of the prestigious Journals of the country.

The First Research paper in this Issue is of Neel Kamal Singha and O. Ranjit Singh, who have thrown good light on Prehistoric Landscape of Assam and Meghalaya. Three Research Scholars- Pushpendra Kumar Nandan, Praveen Kumar and Yogita Baviskar have done realistic investigation and analysis of Prehistoric Rock Painting of Usrar and Singhpur district of Satna. Naheed Ahmad and Yogendra Singh Farswan have done best effort to establish Archaeological link between Neolithic and Harappan Civilization of Kashmir. Vijay Sarde has presented the Archaeological Study of Nath Community of Pune. Similarly, a proper logical study of the brick built Wharf

obtained from the excavations of Pakkakot has been done by the scholars of Archaeology Sita Ram Dubey and Santosh Kumar Singh. A new discourse has been revealed to the scholars by Brijesh Rawat on the basis of the archaeology of Cambodia. In the following Research Papers Sandeep Kumar Chaudhary and Durgesh Kumar Srivastava have presented the archaeological features of Basti District of Uttar Pradesh, Vineet Godhal, a scholar of Prehistory has presented a paper on the Prehistory of Alwar district of Rajasthan. Ashish S. Shende has drawn a holistic outline of Chariot depiction in Rock Painting of Chalcolithic Period of Central India and similarly presented a Critical Analysis of the Rock Paintings of the Central Chhattisgarh Region.

Rajmal Jain, a specialist on Jain Culture and Archaeology has presented an excellent archaeological paper on the Sharman culture of the Tigray region Ethiopia. Pranab K. Chattopadhyay, a renowned Archaeometallurgist of the country and abroad, has done important research work on the history and origin of the Mirrors. Santosh Kumar Singh, a young scholar of archaeology has in his paper given the Archaeological evidence of Early Medieval Urbanization of North India with special reference to the Siyadoni and Ahar stone inscriptions. Archaeologist Jalaj Kumar Tiwari has mentioned about the antiquities obtained from excavations at Kolhua between 1983-93. Ratana Singh has given a detailed description of Ahichchhatra and its antiquities. Similarly an important paper has been prepared by Ranimole S.J., Vinuraj B. and Aswani O. K., which is the analytical study of the Ananthashayana Series Coins of the Venad Dynasty. Artision Ardhendu Ray has presented a Hypothetical Observation of Wine Use in Early Historic Sanghol. Kamta Prasad Verma and Brijesh Rawat studies the Chhattisgarh's Parvati sculptures.

A special article has been presented by Varsha Rani titled Depiction of Power in the Jaina Art and Architecture of Sravanbelgola. Joint article of Smriti Pathak and Archaeologist S.K. Dwivedi's being presented is based on some distinguished statues of Yakshi Ambika of Gwalior region. A paper on The evolution of the Gurdwara by Amir Ali, Muhammad Hameed and Mahboob Hussain is based on the socio-religious contribution of the Sikh Community also forms a part of this Journal. The Joint paper of Ravindra Kumar, Deepak Kumar and Neel Kamal Sinha is based on Ideology, Power and Conquests, Representation of South Asia in European Cartography, The article of Devendra Gupta and Deepak Kumar is also based on Cartography in which the description of Battles and Sieges is given. Next article by Parul Sharma and S.K. Dwivedi's duly prepared in which there is mention of Miniature Painting in *Pichhvai* Tradition. Amarjeet Kumar and Manoj Kumar Tailor have shown in their paper the importance of *Aripan* which is popular in Mithilanchal. Famous Conservator Sayeed Jamal Hasan in his distinctive article has described of the challenges of the Conservative of Monuments standing on the mountains of Uttara Khand and the last important research paper is jointly written by Saroj Kumari, Surabhi Srivastava and Archit Srivastava in which meaningful technical analysis of exploratory data has been done of the sculptures and artefacts belonging to Gupta period that has been displayed in Panchal Museum, Bareilly.

Thus, in this Issue total of twenty seven articles are included. The creator of these papers are independent, senior prestigious, young and research scholars. The said authors are associated with Archaeological Survey of India, State Archaeology Department, Museum, Universities and Educational Institutes. Scholars as always are not only from India but also from the foreign countries like Pakistan, USA, Canada etc. Article almost touches all the dimensions of Archaeology

be it –Explorations, Excavations, Reports, Prehistory, Proto-history, Rock Art, Chalcolithic, Art, Iconography, Architecture, Epigraphy, Numismatics, Conservation etc. Two articles are related to culture and tradition. Twenty three articles are published in English while four are published in Hindi. Hence, through the medium of ICON the light has been thrown on Archaeology, Culture and tradition, Brahmanism, Buddhism and Jainism.

Hence, first of all, ICON family extends its sincere thanks to our famous prestigious authors and creators and believes that we will continuously receive your contribution.

ICON family will always be grateful and indebted to Indian Council of Historical Research, New Delhi because the said institute has given the financial aid for its publication.

We are also heartily grateful to Dr. Rajmal Jain as he has written excellent obituary of Late Shir Nirmal Kumar Jain Sethi on our request. Our gratitude to Research India Press, New Delhi, for printing this marvellous Journal. At the same time it is expected that this issue of ICON too would attract eminent scholars, writers, archaeologists, research scholars, students and general readers.

AMIYA CHANDRA • BRIJESH RAWAT

ICON

Journal of Archaeology and Culture

LIFE MEMBERS

Beerendra Kumar
Kushi Nagar

Sunil Kumar Jha
Patna

Biri Singh
Patna

Sangeeta Singh
Kushi Nagar

I.P. Pandey
Lucknow

Surabhi Srivastava
Lucknow

Jaishankar Naik
Rachi

Sarjun Prasad
New Delhi

Alok Kumar
Lucknow

Santosh Kumar Singh
Varanasi

Manual Joseph
New Delhi

Manjil Hazarika
Assam

Gyanendra Pratap Singh
Lucknow

Parth Singh Kaushik
Lucknow

Sanjay Singh
Lucknow

Praveen Kesari
New Delhi

Amita Shukla
Lucknow

Vibha Pandey
Lucknow

Sachin Kumar Tiwari
Varanasi

Pataru Maurya
New Delhi

Tsheerin Fun Chowk
Jammu

Yesu Babu M.
Hyderabad

Aparana
Lucknow

Rajendra Yadav
Bhopal

Vinay Kumar
Varanasi

Anjana Tiwari
Lucknow

Ankur Singh
Lucknow

NOTES FOR CONTRIBUTORS

1. This journal welcomes the research papers related to Archaeology, Ancient History, Culture and Books Reviews.
2. The articles may be written in English and Hindi.
3. All manuscripts should be typed in double space on one side of each page.
4. Diacritical marks should be clear.
5. Photography should be in colour, the quality of the photographs should be clear and good.
6. Detailed references should be given at the end of the article in a chronological order.
7. Acknowledgment for photographs, drawing and various other helps should be mentioned below the concerned object.
8. In the selection of research papers, photographs and line drawings, the decision of the editorial board will be the final.
9. The Editorial Board will not be responsible for views expressed in articles.
10. After the publication of the articles, a fresh copy of the journal will be given to the author.
11. The contributors are requested to give their full official address and Email address in their articles.
12. The research papers may be sent by post or Email them at the address given below:

DR. BRIJESH RAWAT

Department of History

Dr. Shakuntala Misra National Rehabilitation University

Mohaan Road, Lucknow, Uttar Pradesh, 226017, INDIA

E-mail: iconjournal2014@gmail.com

rawat.brijesh11@gmail.com



Goricho Jaina Mandira in Pakistan Built in 300 AD

■ Rajmal Jain*

Abstract

We report the iconography and brief details of a recent discovery of Goricho Jain a Mandir in Pakistan built in 300 AD. The temple was dedicated to the 23rd Jain Tirthankar Parshwanath. Thus bhagwan Parshwanath is moolnayak (head/ centroid idol) of this temple. This Gori Jo temple along with Jain temples of Nagarparkar were inscribed on the tentative list for UNESCO World Heritage status in 2016 as the Nagarparkar Cultural Landscape. The name of this temple was changed several times in the course of the centuries based on the desire and choice of the ruling king, emperor and British Empire. It was built in 300 AD by Gorichom a Jain worshiper. Although there are no evidences of nationality of Mr. Gori Jo/ Goricho/ Gorichem but as the name appears, perhaps, he was either from Dutch (Netherlands) or from a land presently known as Iran. We present the temple location and many other features related to worshipping of Shri Parshwanath. Our preliminary study reveals that British rulers destroyed this temple at large and not by the Islamic rulers. The stone carvings exhibit a high level of expertise and dedication revealing that the Jain culture was at the apex in Thar Desert during that era. But despite this grand past, this temple is no longer visited by any worshippers and lacks even a single caretaker. We recommend to Jain leaders and Govt. of India to initiate the efforts to develop this place as tourism center in view of its glorious history and a unique symbol of architecture.

1. Introduction:

It has been now widely established that Jainism is an eternal religion i.e. Jainism existed from the beginning of humanity and will exist till infinite time (von Glasenapp, Helmuth, 1925, Jain, Rajmal, 2021). It has also been noted that some scholars as well as religious leaders misleadingly attempt to establish that Jainism is founded recently by 24th Tirthankara Mahāvīra (527-599 BCE) or it is an offshoot of Buddhism or Hinduism. Some suggest that, perhaps, it has been established by Shri Rishabhnaatha, the first tirthankara of present *Avasarpanikaal* of Kaal Chakra (Jain time cycle) and lived for 8400000 *purvas* on this planet (Zimmer, 1953). However, according to Beversluis (2000) the Jainism originating on the Indian sub-continent is one of the oldest religions of its homeland and indeed of the world, having pre-historic origins before 3000 BCE and the

* Physical Research Laboratory, (PRL) (Dept. of Space), Ahmedabad, and All India Digamber Jain Mahasabha, New Delhi, Mob. : 9427001972, rajmal_9@yahoo.com

propagation of Indo-Aryan culture. This is further established with the verse quoted in Rigveda as follows.

ऋषभं मासमानानांसपन्तानाविषासहिम् ।

हन्तारंशत्रूणांकृधिविराजंगोपतिंगवाम ॥११॥ (Rigveda 10.166.1)

Ancient history of India reveals that there were three major religions in India viz. Jainism (Nirgrantha), Buddhism and Brahminism. Latest research and excavation at Mohenjodaro and Harappa has shown that Jainism existed before five thousands year ago (Jain, Rajmal, 2021). However, the Jain scriptures (Aagams) endorse that the Jainism is eternal. This fact and truth from the canonical texts suggests that the Jain religion goes back to a remote antiquity. The antiquity in question being that of the pre-Aryan, so called Dravidian illuminated by the discovery of a series of great late stone-age cities in Indus valley, dating from third to fourth millennium BCE.

The Jainism is a religion of the Earth and Cosmic order (Rajmal Jain, 2020, 2021) and accordingly Jainism says that there is “*No God*” to create any substance. The cosmos and its components are eternal, and any changes or modifications which are visible to us, in fact, are internal of the existing system i.e. it is a self-organized system (Aaryika Sudradhmati Mataji, 2021). However, misleadingly many investigators and scholars attempted to probe its originality in terms of physical beginning and reported that it was started by 24th tirthankar Mahāvīra and other tirthankars are mythical (von Glasenapp, 1925). On the contrary, Dr. Sarvepalli Radhakrishnan, the first vice president of India, said that the Jainism was in existence long before the Vedas were composed (Jambuvijaya, Muni, 2002). The last two tirthankaras Parshwanatha and Mahāvīra (599 – 527 BCE) are considered historical figures (Zimmer, 1953, von Glasenapp, 1925), and the Mahāvīra was a contemporary of the Buddha (Dundas, 2002). In this view most of the Jain temples before 1000 years BCE, all over the globe, are of Rishabhdev, Chandraprabhu and other tirthankars (Jain Rajmal, 2020, 2021), while, on the other hand, temples constructed in the greater India (*Vrihad Bharat*) of Chandragupta Maurya (324-297 BCE) most of temples were constructed with moolnayak as Parshwanath or Mahavir. Maurya Empire is shown in Figure 1 (left) and extended part in north-west (right). It may be noted that in north-west Maurya Empire was existing beyond current Pakistan, Afghanistan, Iran, Iraq (all Arab countries), Greece, Roman (including Dutch and other nearby countries). In above context it is very common to get statues of Jain idols in general and of Parshwanath and mahavir in particular upon the excavation in Asia and north-west Asia. However, as we are aware that the Arab, Afghanistan and Pakistan were integral part of Vrihad Bharat (Greater India) so finding statues of Jain Tirthankars is not a

surprise but discovering a unique architecture and historical temple monument and its still existence is definitely a matter of pride for Jain community. In this article we describe **Goricho Jain Mandir**, which is proposed to be of Parshwanath as moolnayak. It is also now been known that there was a series of Jain temples in the Thar desert of Pakistan..

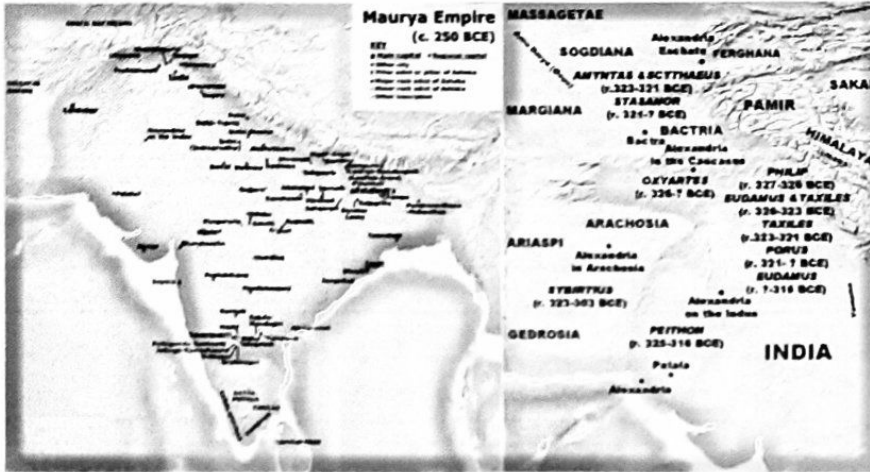


Figure 1: Mauryan Empire map (left) and north-west regions ruled by Chandragupta Maurya.

2. Goricho Temple

The Goricho Temple (Gori jo Mandar or Temple of Gori) is a Jain Temple in Nagarparkar (Anis, Ema, 2016). It's about 21 km northwest of the Viravah Temple. It is about 1700 years old, built in 300 AD. The temple was dedicated to the 23rd Jain Tirthankar Lord Parshwanath. Thus bhagwan Parshwanath is *moolnayak* (head/ centroid idol) of this temple. This Gori Jo temple along with Jain temples of Nagarparkar were inscribed on the tentative list for **UNESCO World Heritage** status in 2016 as the **Nagarparkar Cultural Landscape** ("Tentative Lists", UNESCO, 2017). The name of this temple was changed several times in the course of the centuries based on the desire and choice of the ruling king, emperor and British Empire. It was built in 300 AD. by Gorichom a Jain worshiper ("*Gori jo Mandar: Desert rose*". *The Express Tribune*. 2011, 2018). Although there are no evidences of nationality of Mr. Gori Jo/ Goricho/ Gorichem but as the name appears, perhaps, he was either from Dutch (Netherlands) or from a land presently known as Iran. It has been known that during reign of Chandragupta Maurya and later the current India was really *Vrihad Bharat* (Greater India) and as shown in Figure 1, the boarders were extended up to Greece, Roman, Arabian countries etc. Thus it may be concluded that Gorichom might be a Dutch or an Iranian, however, he was a follower and/or saint of Jainism.

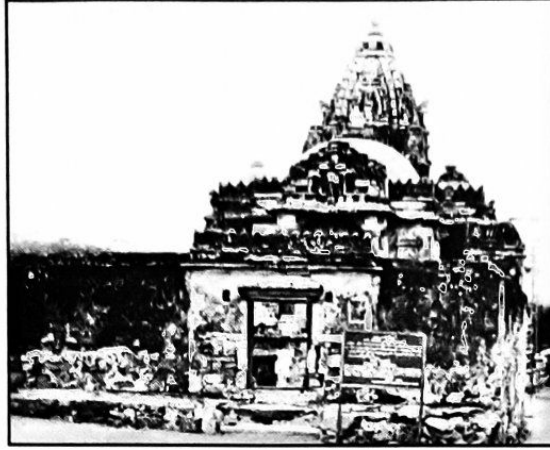


Figure 2: The front view of the Jain Temple in Pakistan built by Goricho in 300 AD.

Shown in Figure 2 is the front-view of the Jain temple constructed by Goricho in Nangarparkar, Pakistan, perhaps in 300 AD. The Goricho/ Gori Jo Jain Mandir is situated between Islamkot and Nangarparkar, Sindh, Pakistan. However, as a function of time the Gori jo Mandir is shrouded in mystery. Even its original name lost in antiquity, having changed many times in the course of the centuries. With no written history of the temple having survived, the only story as to its origin is a legend that it was built by Goricho, a Jain worshiper in 300 AD. This legend is supported by historian Richard Rathore, who in his book “**Old Tharparker**”, writes that this temple was built by Goricho, a saint of the Jain religion and follower of Mahavira (599-527 BC). The temple is built with intricately carved stones, the building has 52 steeples/ shikhar (*Bawan Jinalaya*) and several small grotto rooms (caves), as may be observed in Figure 3, some of which can accommodate only one monk for renunciation (tapasya). The caves resemble with those existing in Axum in the Tigray region of Ethiopia where the Śramaṇa Culture was at apex and accomplished (Jain Rajmal, 2020).

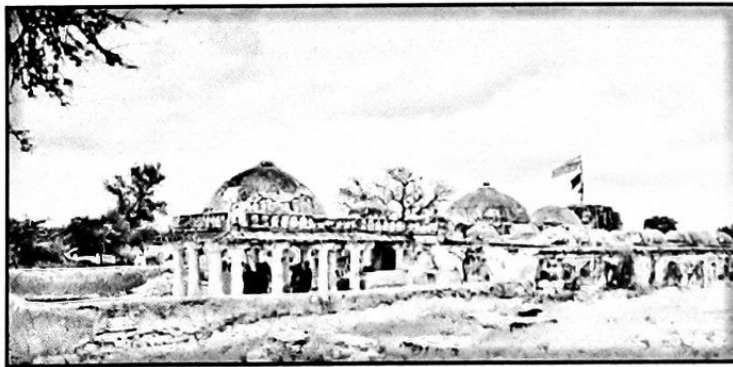


Figure 3: The far-view of the Goricho Jain Mandir in Nangarparkar, Sindh Pakistan. The small grotto rooms (caves) may also be noted.

The main objective of the temple was to worship the lord Parshwanath and thereby the purpose was religious. However, the politics played a role against the objective in general and in particular for its downfall, According to Rathore "The British military destroyed some part of this temple because they found out that conspiracies against British rule were being hatched here".

Gori jo Mandar makes an immediate impression on those intrepid visitors willing to travel to this lonely spot. The temple was constructed with marble, probably brought here from Gujarat. According to Professor Altaf Aseem, former head of department of Archeology at Khairpur's Shah Abdul Latif University, the main architectural feature of this temple was its 54 beautifully built domes, which no longer exist. Now as a function of time and without attention of management it is destroyed but the passage to Garbhgraha may be clearly noted in Figure 4.



Figure 4: This is Gori Jo Jain Mandir in Nagarparkar, Sindh Pakistan. The passage to Garbhgraha (gambhala) is clearly seen.

Gori jo Mandir was also a place of learning; the wide corridors of the building served to accommodate the many students that came to study Jainism, pray and learn in these halls. At the heart of the temple is a circular hall around which are small rooms, supposedly once used to accommodate students. Some historians even claim that Rabindranath Tagore himself was inspired by this place to create the university town of Shanti-Niketan, situated between Mithi and Islamkot.

According to 70 year old Kheenro Bheel, a local villager, "a celebration is held every year on the fourteenth night (Chaudas ki raat) of Bhado (the sixth month of the Hindu calendar) at this temple and after that no one goes there". Mr. Kheenro Bheel told that he has never seen anyone from the government coming to the temple site to survey or help to restore the building". The villagers nearby to the

temple say "the long-awaited rains do not just bring a touch of green to the otherwise barren Thar Desert, they also bring tourists, and thus the rains and the visitors are a lifeline. The west side of the temple is destroyed, and there is no one to rebuild it. The villagers who live nearby are too poor to arrange their food for two times of a day. Further, they have no idea of the significance of the place. Even if they did, such a monumental task is beyond their meager resources. According to a local journalist Mr. Khatao Jani "The archeological authorities are least concerned about this unique symbol of architecture and history".

The dotting of the landscape of Thar's Karoonjhar hills reveals presence of fifty other temples, which reminds of a time this area, was not a forgotten backwater but a *thriving cultural center*. Among these relics of the past is the magnificent *Bhodesar temple*, which is built on a high platform and reached by a series of steps carved into the rock. Huge stone slabs constitute grand columns carved with Jain worship statues. These stone carvings exhibit a high level of expertise and dedication revealing that the Jain culture was at the apex in Thar Desert during that era. But despite this grand past, this temple is no longer visited by any worshippers and lacks even a single caretaker. The steady silence and loneliness of this place is only broken by the cawing of crows during the day and the screeching of bats by night. The bell of the temple is rusted and columns of ants march through cracks in the damaged walls.

Earlier Jains were offering *Panchamrit Abhishek* (water, milk, curd, saffron, sandalwood and flowers) to the statues (idols) and *ashta dravya puja* which always kept the temple incensing and live. The temple was witnessing dance of peacocks and peahens along with the songs of local legend Yousif Faqeer creating the atmosphere pleasant. No one who comes here should miss the stirring melodies of this blind folk singer. But with the passing away of the rainy season, the legendary incense of Panchamrit Abhishek and puja as well as the elusive greenery, the visitors also disappear, and the temples of Tharparkar resumed their silent vigil, waiting for a spring that may perhaps never come. However, currently this historical heritage is in a terrible state of ruin and the only sign of the government's presence is a solitary sign asking visitors not to damage the buildings. Despite this sign, not a single temple is whole and complete, and it is obvious that not all of the damage has been caused by the elements. We conclude that a series of temples might have been constructed by the Jain business community on the route from Gujarat and Rajasthan to Pakistan and beyond to Gulf countries via Thar Desert. However, the Gori jo Mandir appears to be the most oldest and unique in view of its architecture, though provoking design and history. Exploration of this temple as well as other Jain temples in Pakistan and beyond is extremely essential in view of antiquity of Jainism.

References:

- Aaryika Sudradhmati Mataji, 2021, "Universe – a self-organized system" in the Proceedings of International Symposium on "Lok-Alok Ke Rahasya" held during 11-14 November 2021, in editing phase
- Anis, Ema (2016-02-19). "Secrets of Thar: A Jain temple, a mosque and a 'magical' well". DAWN.COM. Retrieved 2018-12-21.
- Beverluis, Joel Diederik (2000), *Sourcebook of the World's Religions: An Interfaith Guide to Religion and Spirituality*, Novato, CA: New World Library, ISBN 1-57731-121-3
- Dundas, Paul (2002) [1992], *The Jains* (Second ed.), London and New York City: Routledge, ISBN 0-415-26605-X
- Jambuvijaya, Muni (2002), Piotr Balcerowicz & Marek Mejer (ed.), *Essays in Jaina Philosophy and Religion*, Motilal Banarsidass, ISBN 81-208-1977-2
- Jain, Rajmal, 2020, "Exploring Śramaṇa Culture/ Jainism in the Tigray Region of Ethiopia", *Journal of Archaeology and Culture*, in press (publication delayed due to COVID-2019).
- Jain, Rajmal, 2021, "Antiquity of Jainism", *Journal of Archaeology and Culture*, in press (publication delayed due to COVID-2019).
- von Glasenapp, Helmuth (1925), *Jainism: An Indian Religion of Salvation [Der Jainismus: Eine Indische Erlosungsreligion]*, Shridhar B. Shrotri (trans.), Delhi: Motilal Banarsidass (Reprinted: 1999), ISBN 81-208-1376-6
- Zimmer, Heinrich (1953) [April 1952], Campbell, Joseph (ed.), *Philosophies Of India*, London, E.C. 4: Routledge & Kegan Paul Ltd, ISBN 978-81-208-0739-6
- "Tentative Lists". UNESCO. Retrieved 16 September 2017.
- "Gori jo Mandar: Desert rose". *The Express Tribune*. 2011-02-02. Retrieved 2018-12-21.
- Received : 18.04.2021
- (We have not used dicritical marks in this article due to some reasons - Editor)