

Ethno-ecological Introspection into *Bhagawatgeeta*:

I. The Cosmic Ecology

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ABSTRACT The *Geeta* is an ocean of wisdom. It reveals knowledge for all concerned. Every culture finds nurturing words for its own philosophy in the *Geeta*. The environmental knowledge presented by Lord Sri Krishna in *Geeta* can be divided into five categories such as: (1) The cosmic ecology, (2) Principles and components of ecosystem, (3) Ecological responsibility of human beings, (4) The present distorted environment compared to the then and (5) Remification and conservation of biodiversity. The present communication is based on the awesome nature of the cosmos; the age of the universe-its creation and destruction, as well the evolution of the biological world.

INTRODUCTION

‘OUM PARIBESAAYA NAMAHA’. This heartfelt respect and honour for the surrounding environment, conveys a humble message to the humanity that the divinity is widely spread up as the Eco-Power around us. *Bhagawan* Sri Krishna has repeatedly presented the spiritual as well as the physical and biological aspects of the environment in the *Geeta*, and tried emphatically to motivate the human society to be conscious of the environment (*Paribesa*). The basic theme of all the ecological knowledge rendered by Krishna is-*Prakruthi: Rakshathi Rakshitha* (Nature protects, if she is protected). The *Geeta* declares (*Addhaya 17 / Ssloka 23*) that ‘OUM’, ‘TAT’, ‘SAT’ are the three fold appellations of the absolute (*Brahma*). The acts of sacrifice (*Yajnya*), charity (*Daana*) and austerity (*Tapasya*) are always undertaken by the followers of the *Vedas*, with the utterance of ‘OUM’ in the beginning. Induction of Eco-consciousness in the society for conservation of the environment is a noble social sacrificial work (*Yajnya*), for which scientific austerity (*Tapasya*) is essential. Some one has to offer the concentration of his mind and selfless attitude as charity (*Daana*) to conserve the environment. ‘OUM’ is therefore the most appropriate syllable used in the beginning.

The *Geeta* again says (8/22)- “*Yasyaan-thahsthaani bhuutaani yena sarvavidam tatam*”, meaning that all the living beings dwell within the *Paramatman* (Almighty) who pervades the entire universe. The whole environment should be considered as the totality of God,

which needs to be worshiped and conserved (*Paribesaaya namaha*).

The deliberations in the *Geeta* are the oceanic waves of wisdom. The epic *Mahaabharat* (*Bhismaparva*) has defined *Geeta* as ‘*Sarva Sastramayi*’ (an integration of all subjects). God (Sri Krishna) is endless, and accordingly His advices are also widely pervaded and above the bindings of time and space. The *Geeta* has revealed for all concerned. Every culture finds nurturing words for their own philosophy in *Geeta*. The *Geeta* supports all the ways of worship: *Adwaita Baada* (God is single), *Dwaita Baada* (Dualness of God), *Niraakaara Baada* (God is formless) and *Saakaara Baada* (God with a form). The *Geeta* is meant for *Gyanee, Yogi, Bhakta, Karmi, Sansaari, Sanyaasi* and for people of every class and cult. Whoever he may be, if he dips deep into the knowledge stream of *Geeta*, certainly he collects the nectar water to quench his own divine desire.

METHODS OF STUDY

Human relationship with the surrounding biota is as ancient as the evolution of man. The subject ethno-biology is a thrust area of research which brings out man’s relationship with bio-resources, with greater emphasis on cultural, spiritual and social aspects. The interrelationship between man and the surrounding biota is of two types: (a) material relationship and (b) cultural or spiritual relationship. Such relationship can be further categorized into four sub-groups, that is,

- (i) Relationships useful, both to men and biota;
- (ii) Relationship useful to men, but harmful to biota;
- (iii) Relationship useful to biota, but harmful to men; and
- (iv) Relationship harmful both to men and biota (Jain 2001).

The cultural / spiritual relationship is mostly presumed to be useful to both men and biota, through activities like worship, protection and conservation of plants and animals. Thus any knowledge existing in a organized and/or codified form has a primary origin from common man itself. As an outcome from his diversified inter-relationship with the surrounding biota, known as empirical knowledge, folk knowledge or ethnic knowledge, have passed through oral information or through other alternative forms. The science of ethno-biology is committed to explore such biological knowledge restricted to common man, may seem to be unjustified or scientifically not supported by experimental data; but is traditional and more nearer to human conception and reality. Ethno-ecology, an important sub-discipline of ethno-biology, deals with the study of the past and present interrelationship of human societies and their living and non-living environment (Padhy 2000).

Research methodology in ethno-biology can be put into two categories, viz. (1) Field research and (2) Literary research. Man in the present age is curious enough to search for scientific aspects in every subject and object. This does not of course mean that, ancient people were not scientifically conscious. Every civilization has its own records of their past science and culture, either in the form of writing being engraved on palm leaf, metallic plate or rock surface; in religious or cultural practices; in sculpture and painting, lore and local literature. Study of such ancient literature and mythology under the literary research is a new dimension in ethno-biological investigation (Padhy 1998), as approved earlier (Jain and Rao 1983); and conveys the ancient scientific thoughts, encapsulated in Sanskrit (or any other language) hymns and religious icons in symbolic terms and forms respectively. To bring out such knowledge under any faculty, may be a Herculean task, but it bridges the gap between the past and present scientific thoughts. Few attempts by the author during the past two decades in this line of literature

research, under the banner of ethno-biology- to explore the ancient science in *Manusmruti* (Padhy 2000, 2009, 2010; Padhy et al. 2001b); to search the scientific basis of *Purnanic* myths (Padhy 2006 a b c; Padhy et al. 1999, 2001a; Panigrahy et al. 2002a b); to re-establish the glory of the Vedic age plant *soma* (Padhy et al. 2001c) and introducing a new sub-discipline Astro-Ethnobiology (Padhy et al. 2005a, b) are proved to be successful. In the present context, an attempt is made to explore the ancient ecological thoughts revealed by *Bhagawan* Srikrishna in *Bhagawatgeetaa*. The study will provide a greater scope to realize that the ancient Indian environmental and ethical education deserves a rediscovery and needs an ecological implementation in the present context. The whole environmental knowledge of the *Geetaa* is studied under the following category: The cosmic ecology; The ecological factors; Flow of energy in ecosystem; Nature's hydrological cycle; Socio-ecological pyramids; Ecological niche; Ecological responsibility; Distorted environment and Expansion and Conservation of Biodiversity. Books on *Geetaa* written by Prof. P. Lal (1965), Swami Chidhavananda (1965), A.C. Bhaktivedanta Swami Prabhupada (1972), Syt. Jayadaya Goyandka (English translation) (2002) and Swami Srikantananda (2003) are followed to pick up the right meaning of the *Sslokas*. The scientific thoughts concealed within the Sanskrit *Sslokas* are carefully compared with the basic themes of modern environmental science. Care is taken not to superimpose the modern scientific concepts on the basic contents of the ancient literature and all the treatises of literary research are strictly followed (Mohapatra 2003). The work is presented as retrospective in approach and introspective in vision, instead of being informative only.

THE UNIVERSE IS AWESOME

Cosmology is the study of the general nature of the universe in space and in time- what it is now, what is was in the past and what it is likely to be in future. The modern cosmologists believe that the universe began as a dense kernel of matter and radiant energy, a highly compressed and extremely hot state, known as the primeval nucleus. The entire matter of the universe was squeezed into a single mass, a big fire ball, which exploded (Big Bang) and the scat-

tered parts cooled to give birth the galaxies which continued to expand continuously moving away from each other. In the beginning of the past century we were aware of a single galaxy, our milky way. Now we know that there are more than 100 billion galaxies in the observable universe (Krauss 2012). A hymn from *Rig Veda* explains the vastness of the cosmos is presented in the Box-1. Our solar system contains many planets, satellites, comets and asteroids along with the Sun. It appears to be so big to us, but it is only a small part of our milky way. The Milky Way contains innumerable solar systems of this kind; its expansion is beyond our imagination. The vastness of the universe with 100 billion galaxies is impossible to visualize. In a simple correlation, the stars and planets, we are familiar with, are like few dusts among the endless sand particles lying on the sea-shores.

Box-1

Rig Veda 8.70.5

Immense is Thy vastness
and Thy glory unparalleled
O' Mighty and magnificent Lord

Hundreds of earths, suns and planets
within our sight;
or beyond our perceptions
exist under this command

But Thou art even beyond
these

All the world existent or non-existent,
born and unborn
are just a fraction
of Thy limitless being

Around Thee move
all the planets of universe.

Transcreation: Vidyalkar (1974)

Theme: How vast the cosmos is (?) - beyond our perceptions.

The shape and size of the universe is no doubt awesome. When we think about its expansion we get confused yet it is claimed in the *Geetaa* that Arjuna had visualized the universe at a glance. Of course, he vouchsafed the divine manifestation (with telescopic eye) of Lord Krishna; yet at the same time his mind was swayed away by fear of the vision. The transcendental vision of Arjuna was the unequivocal perception of Hindu cosmic ecology at a

glance, the way the ancient people have realized the universe. *Maharsi Vyaasa* writes (*Geetaa* 11/12):

- * "If there be the effulgence of thousand sun bursting forth all at once in the heavens, even that would hardly approach the splendour of the mighty Lord".

This explanation is similar to the vision of the universe as per the modern physics. Arjuna has described the vision with the following words (Fig.1).

- * "I see neither your beginning nor middle, nor even your end, manifested as you are in the form of the universe (11/16)".
- * "A mass of splendour flaming all around, having the brilliance of a blazing fire and the sun, hard to gaze at and immeasurable on all sides (11/17)".
- * "You are the supreme indestructible; the ultimate refuge of this universe; the eternal imperishable (11/18)".
- * "You are possessing unlimited prowess, having the moon and sun for your eyes, endowed with numberless arms, mouths, eyes, thighs, feet and bellies. The blazing fire is coming from your mouth and your radiance is scorching this universe (11/19, 23)".
- * "The space between the heaven and earth and all the quarters are entirely filled by you (11/20)".
- * "Your form reaching the heavens, effulgent multi-coloured, having its mouth open and possessing large flaming eyes (11/24)".
- * "Your faces are frightful and flaring like fire at the time of universal destruction (11/25)".
- * "Your terrible splendours are burning the entire universe, filling it with radiance (11/30)".

After the cosmic revelation (*Biswaroopa Darshana*) Arjuna was terror-struck and asked *Bhagabaan*:

- * "Tell me who are you, O fiery-formed; O Krishna, have pity. How can I know you (11/31)".

God Answered

- * "I am inflamed *Kaala* (the eternal Time-Spirit), the destroyer of the worlds (11/32)".
- * He, who understands the time factor of the universe, he realizes that even the world of

Brahma (the creation power) can not escape rebirth (8/16).

Time is responsible for the process of creation, maintenance and destruction in the cosmic ecology. The evolution and end of creation, is time dependent. The rhythmic change in the environment of the universe, keeps pace with the time, is a matter of discussion.

AGE OF THE UNIVERSE

The time concept of ancient Indians as reflected in *Manusmriti*, measures the smallest unit of time, a blink of an eye, called *Nimisha* (0.178 second) (Mohapatra et al. 2001a). Further, in a different calculation in *Bhaagabata*, the *Nimisha* is divided into 900 'Truti' units, speaks about the finest knowledge of time during the post vedic period. The longest time unit calculated is the life span of *Brahma* (the creation power), accounts to 100 *Brahma* years, alternatively 72000 *Kalpas* or 31004×10^{10} earthly years (EY); the total creation period. Twenty four hours of *Brahma* is equal to two *Kalpas*. Each *Kalpa* being a span of time 432×10^7 earthly years is either a day or night of *Brahma*. In the first *Kalpa*, known as *Udaya Kalpa* (day time of *Brahma*) the creation is expanded and in the following *Kshaya Kalpa* (night time of *Brahma*) the creation is squeezed up. So incessantly He revivifies and destroys this creation in alternate *Kalpa*, thus completes His 24 hours of period. Each *Kalpa* period is again divided into 14 *Manvantaras*, each being 30672×10^4 earthly years. The connecting link period between two *Manvantaras* is known as *Sandhya* (each 1728×10^3 EY) during which the world remains in submerged state, a great cataclysm period. Each *Manvantara* is again divided into 71 *Chaturyugas*. The *Chaturyuga* is a time cycle passes on the earth in the name of *Yuga* such as: *Kretaa* (or *Satya*) – 1728×10^3 EY, *Tretaa* – 1269×10^3 EY, *Dvaapara* – 864×10^3 EY and *Kali* – 432×10^3 EY (Mohapatra et al 2001a).

Surya Samhita, an epic devoted to describe the time concept of ancient Indians, claims that the present *Brahma* has enjoyed 50 years of his life span and continuing the present creation on the first day (*Udaya Kalpa*) of his 51st age year. Out of 14 *Manvantaras* of the present *Udaya Kalpa*, six *Manvantaras* and their respective *Sandhya* periods have passed away. At

present we are passing through the 7th *Manvantara*; out of 71 *Chaturyugas* 27 have already covered up and the creation is passing through the *Kali Yuga* of the 28th *Chaturyuga*. The sum total of years since the beginning of this *Kalpa* (present creation) is 1972949112 years till 2012 AD. Ironically the 100 years of human life is only equivalent to 0.001 second of *Brahma*, the creation power (Mohapatra et al. 2001b).

The age of the universe as ascertained by vedic age elites and discussed above seems to be mythical without any supporting evidence. However, to support this modern age calculations need to be discussed. There are scientific efforts to fix the age of the earth by indirect methods based on facts like:

- (1) **Sedimentation Clock** (Average annual rate of sedimentation and the thickness of all strata deposited during the whole geological history- age of the earth 510 million years).
- (2) **Salinity Clock** (The rate of accumulation of sodium in ocean water-100 million years).
- (3) **Evolutionary Changes of Animals** (Based on fossil records- 1000 million years).
- (4) **Rate of Cooling of the Earth** (Assuming the initial temperature to be 3900°C – 400 million years).
- (5) On the basis of the **Concept of Separation of the Moon** from the earth (estimated by Charles Darwin)-57 million years.

The discovery of radioactive carbon by Ruben and Kamen in 1940 opened new chapter of science such as tracer techniques to explore the biochemical modes of life and methods to measure the age of the rocks on the half-life of the concern elements (Kamen 1949). The use of radioactive elements like Uranium (U^{238}), Rubidium (Rb^{87}) and Potassium (K^{40}) is to calculate the age of the earth known as 'direct method', which is again estimated to be 4500 million years (Fig.2). Modern physics has assumed that in our region of the universe the elements probably came into being (cosmoatomic state) some time between 4900 to 6000 million years ago. A coordination with the vedic age calculation; in the present creation (*Udaya Kalpa*) 1972949112 years has already covered, plus the pre-existent *Kshaya Kalpa* 432×10^7 EY together constitutes a sum total of 6292,949,112 years; a matter of great coincidence with the 6000 million years scientific-



Fig. 1. *Biswaroopa* (Vision of the Universe): A mythological perception

cally predicted. Supporting the Vedic age concept the *Geetaa* says:

- “Those who know that the day of *Brahma* lasts a thousand *Chaturyugas* and that his night lasts a thousand *Chaturyugas*, they are the knowers of day and night (the reality about time of the universe) (8/17)”.
- “At the coming of the day (of *Brahma*) all manifest beings proceed from the unmanifested, and at the coming of night they merge again in the (same which is called) the unmanifested (8/18)”.
- “The multitude of beings, coming forth again and again, merge, O Partha, in spite of themselves, at the approach of night, and remanifest themselves at the approach of day (8/19)”.
- “All beings O Kaunteya, go into my *Prakriti* (nature) at the end of a *Kalpa*. I generate them again at the beginning of the next (*Udaya*) *Kalpa* (9/7)”.
- “Animating my *Prakriti*, I send forth again and again all this multitude of beings helpless under the regime of *Prakriti* (9/8)”.
- * “Because of my proximity, *Prakriti* produces all this, the moving and unmoving; the world, therefore, resolves, O son of Kunti (9/10)”.

THE CHRONOLOGY OF CREATION

Each *Manvantara* time period discussed earlier (30672×10^4 EY) is ruled by a mythical personality named with a suffix *Manu* (Fig. 2). In the present creation seven glorious *Manus* named (1) *Svayambhu Manu* (2) *Svarachisa Manu* (3) *Auttama Manu* (4) *Taamasa Manu* (5) *Raivata Manu* (6) *Chaakshusha Manu* and (7) *Vaivassvata Manu* (the present ruler) have ruled over the earth, produced and protected the movable and immovable creations (not strictly alone biological) during the time period *Manvantara* allotted to (and also named after) them. Logically but, such a long period *Manvantara* (30672×10^4 EY) compared to the short life span of a human being (if *Manu* is a man) certainly do not attribute the word *Manu* to a person, a sage, a ruler or any other mythological personality. Rather it is convincing that *Manvantara* signifies a geological time unit of ancient Indians, during which the chronology of cosmological, geological and biological evolution had taken

place. The analysis of the Sanskrit names of seven *Manus* have also some coordinated significance amenable to the creation evolved and the paleoecological condition during the then time period as follows (Mohapatra et al. 2001):

1st. *Svayambhu Manu*: *Svayam*+*bhu*; *Svayam*: Self and *bhu*: realisation of his own presence-expression of self, that is, *Self-revelation*. Creation of universe occurred due to self exposure (Big-Bang).

2nd. *Svarachisa Manu*: *Sva*+*Rachisa*; *Sva*: Self and *Rachisa*: derived from the word, *Rachanaa* (Creation-identification), that is, *Self-identification*. Identification of galaxies; planetary world and the earth in it.

3rd. *Auttama Manu*: *Autta* + *Tama*; *Autta*: high and *Tama*: a superlative adjective of the former; objects rendered / contributed, move above their baseline- elevate / raise to higher place / rank up to the bests / top most, that is, Self Contribution. Separation (Contribution- elevation) of satellites from different planets- moon from earth-formation of comets and other astral bodies, etc. Gives clue that the universe is expanding, moving away from the centre.

4th. *Taamasa Manu*: Significantly synonymous to *Taamasa Guna*, a constituent of *Prakriti* (Cosmic substance); Power of nature that restrains or obstructs, restraining or binding potency of nature; function to resist motion, for example, responsible for the downward pull of earth; tendency of water to descent, cause of mass, weight and inertia, feeling invisible air (Bernard 1989), that is, **Self Restraining and Binding**. Solidification of the earth and other planets as well, from gaseous state.

5th. *Raibata Manu*: *Rai*: Aisswarya (the paradise potential)- State of happiness, *Bata* means *Baan*, the possessor; otherwise creation of climatic, edaphic (identification of mines) and biotic (autotrophic) potentialities, that is, **Self-producing Potentiality**. Appearance of autotrophs, the plant world (Primary users of geological resources through biogeochemical cycles). Evolution of chlorophyll pigment.

6th. *Chaakshusha Manu*: Derived from *Chaakshu* (eye); Eye witness is known as *Chaakshusha Pramaana* in judiciary; creation is blessed with sight potentiality, that is, **Self Visioning Potentiality**. Creation of Animal world-Heterotrophs (possessed eye sight or power of cognizance).

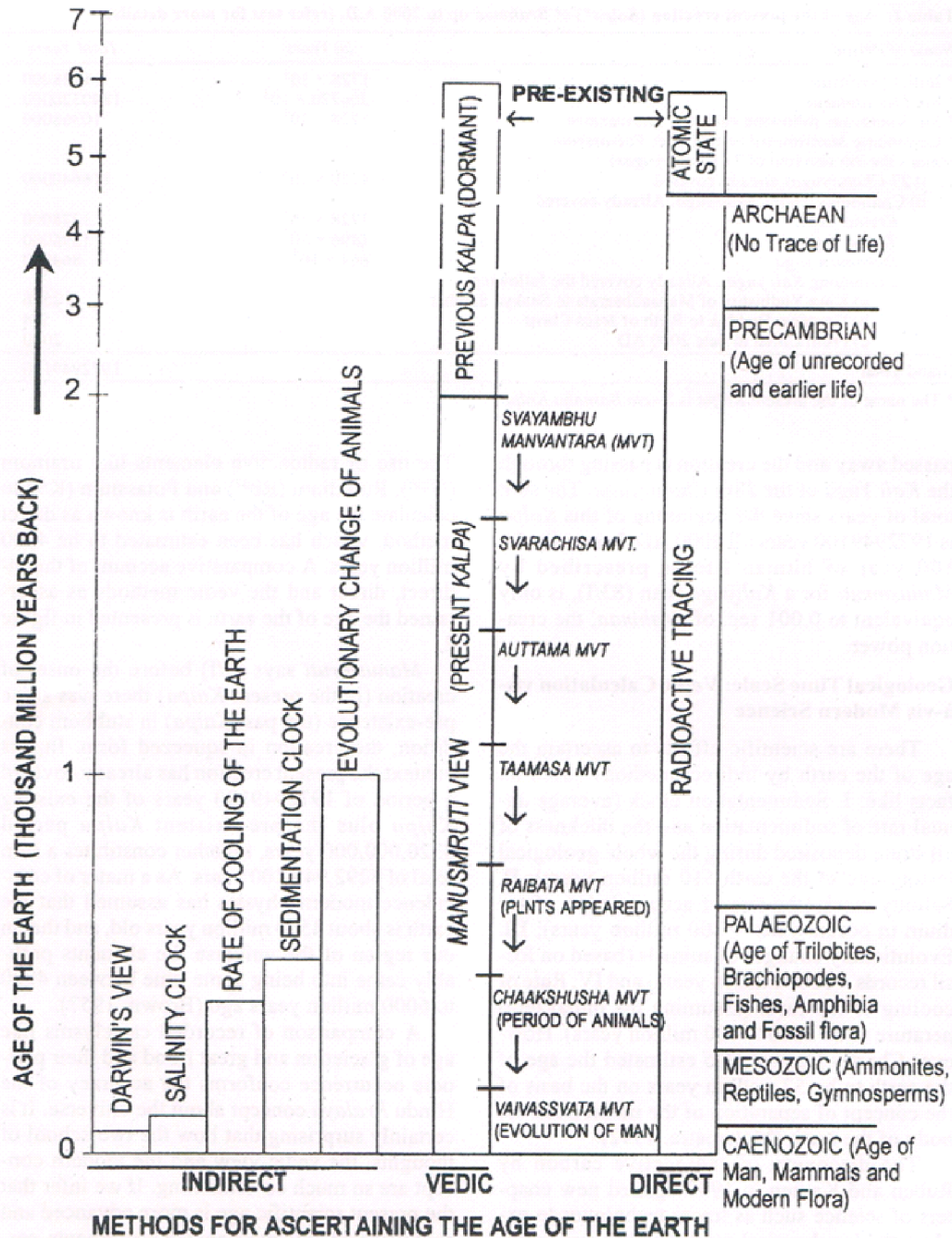


Fig. 2. A comparison of age of the earth as ascertained by various methods and account of Life forms evolved in different period. MVT refers Manvantara: 30672×10^4 EY. (Adopted from Mohapatra et al. 2001b)

7th. *Vaivassvata Manu*: (Designated as *Mahaa Tejaswee*: most powerful). The son (*Putra*) of *Vivassvan* (*Surya*: Sun god) is known as *Vaivassvata* which implies to 'Man'. The word *Putra* is applicable to human male off-spring. Man being supreme of living beings, the top consumer of energy rendered by the sun god in the global ecosystem, that is, *Self Realizing Potentiality*. Evolution of man (that is, organism with rationality) has occurred.

In gist, the universe revealed due to Big-Bang (1st *Manu*), followed by identification of galaxies with their rearrangement and expansion (2nd and 3rd *Manu*). The planetary system with earth cooled down (4th *Manu*). Life appeared on the earth which expanded as the Biodiversity (5th and 6th *Manu*) and finally man evolved (7th *Manu*). (Mohapatra et al. 2001c).

In the chapter ten of the *Geetaa*, Lord Krishna says:

* "The seven great *Rishis* and the four *Manus*, endowed with my power, were born of my mind; and from them have come forth all the creatures in the world" (10/6).

The seven *Rishis* are *Bhrigu*, *Marichi*, *Atri*, *Pulah*, *Pulastya*, *Kratu* and *Angiras*. They are great and known as *Prajapaties* or procreators (Saint Scientists responsible to propagate the biodiversity) as evident from *Manusmruti* (1/35) and *Bhaagawata* (8th Part, XXIV discourse, 32-38 verse). Out of seven ancient *Manus* discussed earlier, the later four are *Taamasa Manu*, *Raibata Manu*, *Chaakshusha Manu* and *Vaivassvata Manu*. These potentates are not of human origin. They are all born of the mind of the creator (10/6). In other words, they are all personifications of the several phases of the cosmic reality. The evolution of Plants, Animals and Humanbeings is evident during the *Raibata*, *Chaakshusha* and *Vaivassvata Manu* as mentioned earlier. During the *Taamasa Manvantara* period the earth cooled down. This refers to a situation, millions of years back the earth's atmosphere was in a highly reduced state filled with gases like Ammonia (NH₃), Carbon Monoxide (CO), Methane (CH₄) etc. By the interaction of these gases with physical forces like electrical discharge and U.V. irradiation, etc. simple molecules could be constituted and aggregated to form more complex ones (Mohapatra et al. 2001c). No one knows how the life created; but the reaction of these organic compounds with one another has given rise to a

system that could reproduce. Probably the major structural organic molecules that constitutes the contemporary cell, were created abiologically before life started (Sagan 1971). This theory was proposed by J.B.S. Haldane and A.I. Oparin independently in the 1920s and further proved by experimental evidences in the earth's primitive state, designed in the laboratories (Wald 1954; Anonymous 1971).

In course of time following the advent of chemical evolution, the macromolecules like proteinoids and precursor nucleic acids joined together (virus like) to form a prototype of modern living cell, further evolved to prokaryotic anaerobes which could survive in extremely reduced condition, present during the pre-cellular period. The photosynthetic process was evolved approximately two billion years ago, along with the changes of earth's atmosphere and consequently photosynthetic bacteria (non-oxygen evolving) and ultimately cyanobacteria (oxygen evolving) were formed. The prokaryotic system transformed to a eukaryotic cell picked up the process of evolution to form a complex life form. The entire scenario has taken millions of years to come up and expanded to the form of multifarious biodiversity as existing today. All these activities might have occurred during the (highly reduced condition of the earth's atmosphere) *Taamasa Manvantara* period as per the *Geetaa*. Srikrishna has flawlessly referred the evolution of all creatures in the world during the four *Manus* only (instead of referring seven *Manus*).

Albert Einstein rightly says:

"when I read the *Bhagawatgeetaa* and reflect about God created this universe, everything else seems so superfluous".

Further work on the environmental aspects of *Geetaa* is discussed in the 2nd, 3rd, 4th and 5th part of this paper.

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