In: Science and Spirituality, 2008, Samvad, New Delhi (M. Paranjape, Ed.), in press

The Concept of Yug: Modern Scientific Approaches to Bridge Spiritual and Philosophical Concepts

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Abstract

Many of the spiritual and philosophical concepts are generally considered off limit to any scientific analysis and evaluation, as the modern scientists consider that science has developed its ideas from the observation of matter, be it in gas, liquid, or solid form. This is far from the truth. There are several examples where philosophical concepts dominated the development of scientific ideas. Some of the contradictory attitude may actually stem more from historical conflicts between religion and the empirical development of scientific principles than a real divergence between the philosophical concepts and scientific ideas. In fact, a sympathetic approach to understand interconnection between science and spirituality/philosophy reveals a more commonality and synergism than conflicts and mutual exclusivity. This article will elaborate on this aspect taking examples of some of the most fundamental concepts such as origin of the universe and time on one hand and understanding the yug cycle on the other.

Matrix of Maya

In 1993, a mainstream scientist and Nobel Laureate, Francis Crick wrote a book on “the scientific search for the soul”. It indicated that scientists are interested in the question deeper basis of the operation of this universe even as they are disillusioned with their search for the most fundamental particles comprising the elements. There is indication that a mental game theory is taking shape from the ancient wisdom of saints and sages in terms of the exploration of Maya. Maya has remained such an integral part of Indian tradition that it has almost become synonymous with life's trials and tribulations for most people living in difficult situations in that part of the world. But for some 'educated' groups of people, the concept of Maya allows them to retain their sanity under the most chaotic conditions created by the time and traits of one’s surroundings.

While Maya is a refuge mostly for people belonging to the lower stratum of society in India, its value is also being recognized in the elite and enlightened class in the West.

The concept of Maya is now being picked up by the popular entertainment industry to drive a message home to a population that can attempt to make sense of Maya in the midst of the chaotic opulence of today’s world, and more importantly, perhaps in the world of tomorrow.

The success of the Warner Brothers blockbuster *Matrix*, as obvious from the release of its three-part *Matrix* sequel, seems to be due to the resonating vibrations within the human populace perhaps worldwide. The movie even included the chanting of *'asato ma sadgamaya'* at the end of the Matrix Revolutions.

Modern Scientists and Indian Traditions

Returning back to the scientific search for the soul, Francis Crick, the celebrated Nobel Laureate for his discovery, along with James Watson, of the double helix structure of DNA encoding the genes, states (Crick, 1993) that "the scientific belief is that our minds - the behavior of our brains - can be explained by the interactions of nerve cells (and other cells) and the molecules associated with them." He continues "... the idea of soul, distinct from the body and not subject to our known scientific laws, is a myth. It is easy to see how such myths could have arisen. Indeed, without the detailed knowledge of the nature of matter and radiation, and of biological evolution, such myths appear only too plausible."

Notably, Frances Crick, a physicist by training, was inspired by a series of lectures by another Nobel Laureate, Erwin Schrodinger, on What is Life in 1940s to make understanding of biological systems his life's mission. Schrodinger himself entertained the idea of another *real* world with the following questions (Schrodinger, 1959):" is my world really the same as yours? Is there one real world to be distinguished from its pictures introjected by way of perception into every one of us? And if so, are these picture like unto the real world or is the latter, the world 'in itself', perhaps very different from the one we perceive?"

Schrodinger himself termed these questions as an arithmetical paradox: "the *many* conscious egos from whose mental experiences the *one* world is concocted." He believed the solution to this paradox would do away with all the above questions. He propounded the idea of "the unification of minds or consciousness." He continued, "Their multiplicity is only apparent, in truth there is only one mind. This is the doctrine of Upanishads. And not only Upanishads. The mystically experienced union with God regularly entails this attitude unless it is opposed by strong existing prejudices; and this means that it is less easily accepted in the West than in the East."

Schrodinger did not have any illusion about the acceptability of such ideas from the scientific point of view. He stated that such an idea would appear "rather lunatic from the point of view of present scientific thought (based on ancient Greek thought and thus thoroughly Western)."

As predicted by Schrodinger, Frances Crick, despite his inspiration from Schrodinger remained vehemently opposed to any reference to a religion or philosophy (Crick, 1993):

“Most of the religious beliefs we have today originated in a time when the earth, while a small place by our standards, was then thought of a being very large, even though its exact extent was unknown. ….. The earth’s origins seemed lost in the mists of time and yet the span of time thought to be involved, while it seemed long in terms of human experience, we now know to be ridiculously short. It was not implausible to believe the earth was less than ten thousand years old. We now know its true age is about 4.6 billion years. The stars seemed far away, fixed perhaps in the spherical firmament, but that the universe extended as far as it does – more than 10 billion light years – was almost inconceivable. (An exception has to be made here for certain eastern religions, such as Hinduism, that take pleasure in inflating times and distances for the sheer joy of it).”

An exception, indeed! In fact, one must take an exception to the Hinduism being referred to as the Western concept of religion, because corrupting a scientific philosophy either with malpractice within the tradition or by branding with unscientific concepts such as religion by outsiders is injustice to the concept of scientific truth.

Age and Lifetime of the Universe

The calculation of age of the universe (or *Bramhand* as is referred to in Indian tradition) has been carried out by physicists for several decades now. It was initially estimated to be about 20 billion years, which has now been revised as 11.2 billion years (Krauss and Chaboyer, 2003). The age of the Bramhand is, however, calculated based on the age of the *Bramha*. According to the *Manusmriti* (I.75), *Brahma’s* one day is 1,000 *dev* yugas, so is one of *Brahma’s* nights (i.e., additional 1,000 *dev* yugas).

Daivikanam yuganam tu sahasram parisankhyaya,
Brahmaikmahargyayam taavati raatrireva cha.

Also, one *dev* yug is equal to 12,000 yugas of *manushyas* (humans), and one yuga (chaturyuga consisting of Krita, Treta, Dwapar, and Kali) of humans is equal to 12,000 years on Earth. Thus, a day of Brahma would be 144 billion years, which is what would be equivalent to the current timeframe of universe. Obviously, this timeframe is much older than the current estimate of lifetime of the universe based on the big bang theory (Krauss and Chaboyer, 2003). Future scientific development would be needed to reconcile this difference if Brahma’s day begins with the creation of the universe as we understand it.

It is notable that astronomical calculations are still in a state of flux for a variety of reasons. Three major factors which may be contributing factors to this uncertainty are as follows. (a) The true nature of matter is still unknown, beyond the fundamental particles identified. Current construct of matter and antimatter,

dark matter and dark energy, and the changing paradigm of fundamental particles raise questions of further changes in astronomical calculations in the future. (b) While the Big Bang theory based on Hubble type expansion seen in the red shifts of the galaxies has been proposed for origin of the universe, there have been many questions on its validity to explain horizon problem, Baryon asymmetry, magnetic nanopoles, etc. (c) There is a major conflict between quantum mechanics and theory of relativity in terms of perceiving an event before and after seeing it, primarily because the theory of relativity assumes speed of light faster than anything else.

Clearly, science is always in the process of evolution. A major strength of science and scientific approach is the self correcting factor. There is always openness to change in science as new data and evidence are produced.

Yug according to Original Scriptures

In contrast to science, scriptures tend to become fixed, although subject to varying interpretations at least in many of the Indic traditions. Inconsistencies between scriptural account of time, space, and origin of the universe may in part be due to the varying interpretations of the relevant maxims. In regards to the time, yug cycle, and origin of the universe, virtually identical shlokas or maxims are found in Manusmriti (*vide supra*) and Mahabharata (Shantiparva 231.11-32).

According to both Manusmriti (1.63-73) and Mahabharata (Shantiparv 231.11-32), chaturyug consists of Satyug or Kritayug of 4,800 years, Tretayug of 3,600 years, Dwaparyuga of 2,400 years, and Kaliyug of 1,200 years, all lasting for a total of 12,000 years. Twelve thousand such years make one Dev yug (Manusmriti, 1.71). Interestingly, there is no such clear definition of Dev yug in Mahabharat, although both Manusmriti (1.67) and Mahabharat (Shantiparv 231.17) describe that one year of man is equal to one Dev day.

Daive ratryahani varsham pravibhagastayo punah
Ahastatrogayanam ratrih syaddakshinayanam (Manusmriti 1.67, Shantiparv 231.17)

(One full year of men makes one day and night of Devas. The Northern solstice is their day and the Southern solstice is their night.)

However, both Manusmriti and Mahabharat mention that 1,000 of 12,000 yugas form a day of Brahma (Manusmriti 1.71; Shantiparv 231.29), and both texts mention the same length of Brahma's night. After end of the night Brahma awakens and creates the Mahtatva, which in turn creates the mind capable of expressing the world or the universe.

Calculation of the life of universe would therefore be as follows:

12,000 man years/chaturyug x 12,000 chaturyuga/Dev yug x 1,000 Dev yug/Bahm day. This will provide an estimate of 144 billion years on Earth for the life of universe or brahmand. Assuming the same length of Brahm night, it gives a total of 288 billion years for one cycle of the universe. Physicists have calculated the current age of the universe as 11.2 billion years (Kraus and Chaboyer, 2003), thus putting it within the realm of the 144-288 billion years calculated from the Indian texts.

A major confusion continues in the estimation of Kaliyug as 432,000 years of which only about 5,000 years appears to have passed. The confusion seems to appear in translation of the 1,200 years of Kaliyug to be as the Dev years, even though none of the shlokas describing chaturyug mention Dev day to be considered for calculations. Since one Dev day is equal to one man year (Manusmriti 1.67; Shantiparv 231.17), one could easily estimate the time of Kaliyug as 1,200 years/Kaliyug x 360 man years/Dev year = 432,000 man years/Kaliyug. This estimation assumes that one Dev year is equal to 360 Dev day (similar to that of one man year being equal to 360 day) even though the length of Dev year is not defined either in Manusmriti or Mahabharat.

In fact, in Mahabharat it is clearly mentioned that Vyas ji is using the man year to describe Brahma's day and night, as well as the chaturyug.

Ye te ratriyahani purve kirtite jeevaloukike
Tayo sankhyay varshagram brahme vakshyamyahahkshape (Shantiparv 231.18)

Prithak samvatsaragrani pravakshyamyanupurvashah
Krite tretayuge chaiva dwapare cha kalou tatha (Shantiparv 231.19)

(As described before – in Shantiparv 231.15-16 – for the jeeva loka, i.e. for man, I will now describe calculation of Brahma's day and night. Also, I will describe similarly the years – samvatsars – of different yugas, such as Krit yug, Treta yug, Dwapar yug, and Kali yug).

Thus, at least the time of Kaliyug to be 432,000 years is questionable, at least according to these scriptures. Another source used for yug calculation has been Bhagwatam, used by His Divinity Swami Prakasanand Saraswati (Saraswati, 1999). His calculation takes into account of the life of Brahma as 100 years for calculating the life of universe to be 155.52 trillion years. He also uses Dev years to calculate a chaturyug cycle of 4.32 million years, which when divided by 360 comes to be just 12,000 years. While current scientific evidence does not support the universe let alone the Earth to be any where close to 155.52 trillion years, there is no evidence to clearly refute it either. Given the fact that many of the Vedic and Pauranic texts mention long time periods, and Indian culture being the only one with such framework of time, it is wise to keep the options open.

Modern Interpretation of the Yug Cycle

According to the interpretations of Sri Yukteswar (Yukteswar, 1949), the Yug cycle consists of a pair (yuga literally means a pair) of descending and ascending periods (**Fig. 1**), 12,000 years each. Quoting Manusmriti, Sri Yukteswar outlines four part yuga cycle – Satya yuga of 4,800 years, Treta yuga of 3,600 years, Dwapar yuga of 2,400 years, and Kali yuga of 1,200 years. The two shlokas describing the yuga period in Manusmriti are as follows:

Chatwaryahuh sahastrani varsanam tatkritam yugam
Tasya tawchhati sandhya sandhyanshashcha tathavidhih (I.69)

(the Krita (satya) yug consists of four thousand years, with 400 years each of the beginning and end transitions (sandhyas), making it 4,800 years.)

Itaresu sasandhyesu sasandhyanshesu cha trisu
Ekapayen vertante sahastrani shatani cha (I.70)

(Of the remaining three yugas, the duration of each succeeding yuga and its transition periods (Sandhya and Sandhyadamsa, or dawn and eve) is less than that of its predecessor by one thousand and one hundred years.)

Sri Yukteswar in Holy Science uses astronomical argument of sun revolving around some star in about 24,000 years of earth – a celestial phenomenon which causes the backward movement of the equinoctial points around zodiac. The sun is also suggested to be revolving a grand center called *Vishnunabhi*, which is believed to be the seat of the creative power, *Brahma*, referred to as universal magnetism.

As the sun goes around its star (or “dual” as it is referred by Sri Yukteswar), it comes to the place nearest to the grand center, the seat of Brahma, dharma, the mental virtue becomes so developed that man can easily comprehend all, even spirit of mysteries, according to Sri Yukteswar (1949). This even takes place when the Autumnal Equinox comes to the first point of Aries. As sun takes the round for another 12,000 years in its orbit, it reaches the farthest point from the grand center. At this point the Autumnal Equinox is on the first point of Libra, and dharma, the mental virtue, is such a reduced state that the man is not able to grasp anything beyond gross material creation. From this point on, the journey of sun continues for another 12,000 years during which dharma, the mental virtue, continues to evolve gradually expanding on the human understanding of the mysteries of the universe.

The pair of 12,000 years, shown as descending and ascending arcs on the yuga chakra in **Fig. 1**, are referred to as Dev yugas or Electric couple. According to the Manusmriti, a dev yug comprises of 12,000 years that consists of the chaturygugas (four yugas – Satya, Treta, Dwapar, and Kali).

Yadetatparisankhyatmadadeva chaturyugam
Etaddvadashsahastram devanam yugmuchyate (I.70)

The uniqueness of Sri Yukteswar's argument lies in linking the definition of the chaturyug with the astronomical observations of sun's orbit around its dual star and its positions at equinoctial points around zodiac. This way he was able to compute two 12,000 years chaturyug in a cycle of 24,000 years, and thus create a solid argument for the association of the yug cycle with physically observable astronomical events which can be verified scientifically. Although this approach was made public in 1894 as Kaivalya Darshanam (Sanskrit), and later as Holy Science in 1949 (in English), the logic and the scientific moorings of the arguments presented have not been picked up by Sanskritists, philosophers, or scientists, in the past 57 years. Consequently, many descriptions of yug cycle appear to be ridiculously computed as millions of years, which are not sustainable from archeological and scientific data, let alone the historical data.

It would be more appropriate for an astronomer to provide a commentary on the astronomical connection of the yug cycle. Astronomy has had many twists in the history of mankind. For example, the age of the universe has been adjusted from approximately 20 billion years to approximately 10 billion years (Britt, 2003). The age of Earth has been adjusted from approximately 6,000 years to about 4.6 billion years (Brush, 2001). The most common theory of the origin of the universe is that of the big bang in which the energy exploded into the space spinning chunks and chunks of matter in the form of galaxies, solar systems and planets, the numbers of each of them are virtually infinite.

That said, it is still a more practical idea to relate modern science findings with the idea of the yug cycles. Swami Yukteshwar's idea of 12,000 years of descending and 12,000 years of ascending yug cycle may be relevant, as would be the idea of 12,000 years chaturyug repeating itself back to back (**Fig. 1**).

An astronomical phenomenon that could be relevant to this discussion is the precession of Earth's axis that takes about 26,000 years (Seeds, 2003; **Fig. 2**). The time scale is certainly similar to the 24,000 years predicted by Swami Yukteshwar, and difference may be explained to certain extent in counting the years in the two systems, and any uncertainty in the variation in the inclination of the axis of Earth's inclination.

This regular cycle of the precession of Earth's axis has strong influence on the climatic behavior of the Earth. According to Michael A. Seeds (2003) 'Precession causes Earth's axis to sweep around a cone with a period of 26,000 years, and that changes the location of the seasons around Earth's orbit. Northern winters now occur when the Earth is 1.7% closer to the sun, but in 13,000 years northern winters will occur on the other side of Earth's orbit where Earth is farther from the sun. Northern winters will be colder, and glaciers may grow.".

Other factors which affect climatic changes are slight variation in the elliptical shape of the Earth's orbit over a period of 100,000 years, and the inclination of Earth's equator to its orbit. Presently, Earth's orbit allows it to be 1.7% closer than average to the sun during northern hemisphere winters and 1.7% farther during the northern hemisphere summers (Seeds, 2003). Currently at 23.5^{o}, this angle varies between 22° to 24° with a period of about 41,000 years.

Scientists believe that the cyclic changes, such as ice ages have origin in astronomical changes (Seeds, 2003). Temperature variations are only obvious changes which scientists are able to monitor (**Fig. 3**). Do these changes have effect on human development and consequently their thoughts and behavior? At least that is what is predicted from the yuga cycle. One should explore this question with an open mind, both from the science as well as philosophical point of view.

Current Popular Practice and Controversies

Popular belief in India about yug cycle considers the age of Kaliyug (supposedly underway in current times) as being 5,107 years as of 2006. There are a couple of textual, astronomical and traditional evidences in support of this belief. Textual references suggest the Kaliyug started after departure of Shri Krishn from the earth in 3102 BCE. Although there is some dispute about the exact date of Mahabharat war and perhaps the departure of Shri Krishn, all the dates are around 3100 BCE. In addition, there is a continuing calendar named Yugadi, which refers to beginning of the yug. According to the Yugadi calendar, practiced in Karnataka and parts of Andhra Pradesh, we are in the year 5,107 (in year 2006) matching perfectly with the departure of Shri Krishn and beginning of the Kaliyug. A problem, however, appears based on a report about the birth date of Shri Ram computed from astronomical references. The date for Shri Ram's birth is computed by Saroj Bala as January 10, 5114 BCE (Bezbaroowa and Joshi, 2003). Traditionally, it is believed that Shri Ram lived on this earth towards end of the Treta yug which is estimated to last for 3,600 years (or 1,296,000 years taking 3,600 years as Dev years). If Dwapar follows Shri Ram's time on earth, then it will have to be about 2,400 (or 864,000 years, considering 2,400 as dev years) before the end of Dwapar. While astronomical calculations based on planetary positions could yield more than one estimate of time, current estimates are more consistent with the idea of yug years in the text being considered as human years.

Thus the major conflict between the meanings of the verses cited above and interpretations propounded in almost all the texts exists in terms of whether years referred to in the verses are dev or human years. Although there is no mention of dev years in the verses I.69 and I.70 of *Manusmriti*, a dev day is defined as one year of humans on Earth in verse 1.67, i.e., one year of devas is considered as 360 human years on Earth. Therefore, 1,200 years for Kali yug is normally

calculated as 1,200 x 360 = 432,000 years (e.g., Shashtri, 1997; Sharma, 1998). This number is normally quoted in popular writings, with assertions that only about 5,000 years have passed, so far, with about 427,000 years yet to go. These assertions are in contrast to many astronomical and archeological reports being presented in recent years.

Indian astronomy goes back to Rig Vedic period, estimated at least five thousand years, and it seems to refer to several layers of time cycles, such as Kalp, Manvantaras, Mahayug, and yug (Kak, 2000). These cycles are to be properly clarified, so that they become consistent not only with each other, but also with the scientific data being collected using modern techniques of carbon dating, astronomy, and archeology. In this context, both Sri Yukteshar, a spiritual master, and Dr. Subhash Kak, a modern scientist, agree on the concept of the yug years in texts like Manusmriti to be ordinary human years. Such approach is likely to not only explain some of the inconsistencies but may actually open new doors for science and philosophy to work together.

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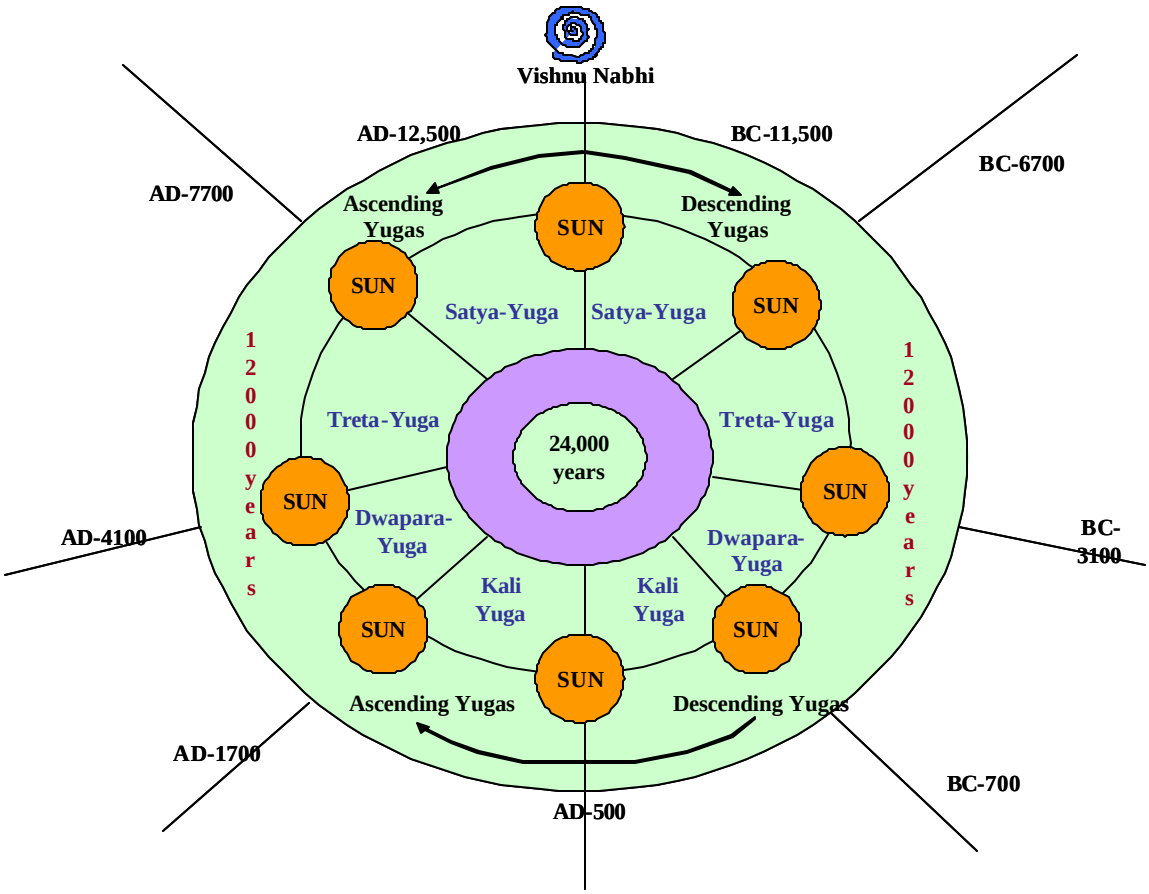

Fig. 1. Representation of yug cycle as proposed by Swami Sri Yukteshwar in his book, Holy Science. This cycle consists of a 12,000 descending chaturyug and a 12,000 ascending chaturyug. According to this model, we are currently about 307 years in ascending Dwapar yug.

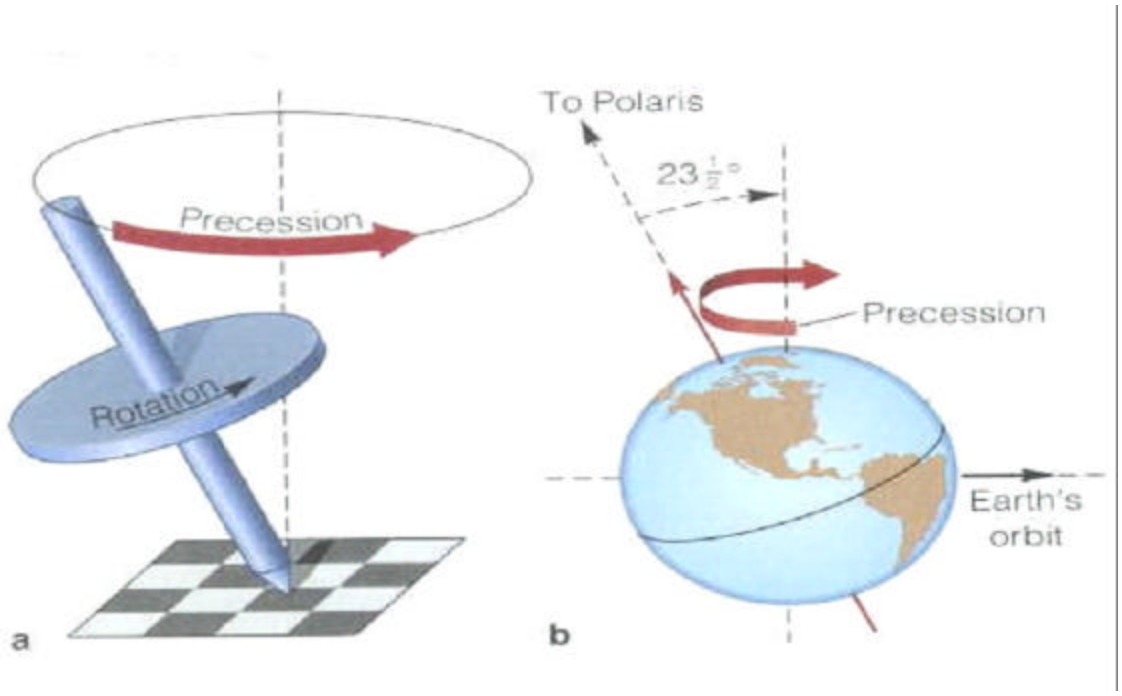

Fig. 2. Schematics showing the precession of Earth's axis like a spinning top in conical motion (a). The Earth precesses around the perpendicular to its orbit. [Taken from Seeds, 2003].

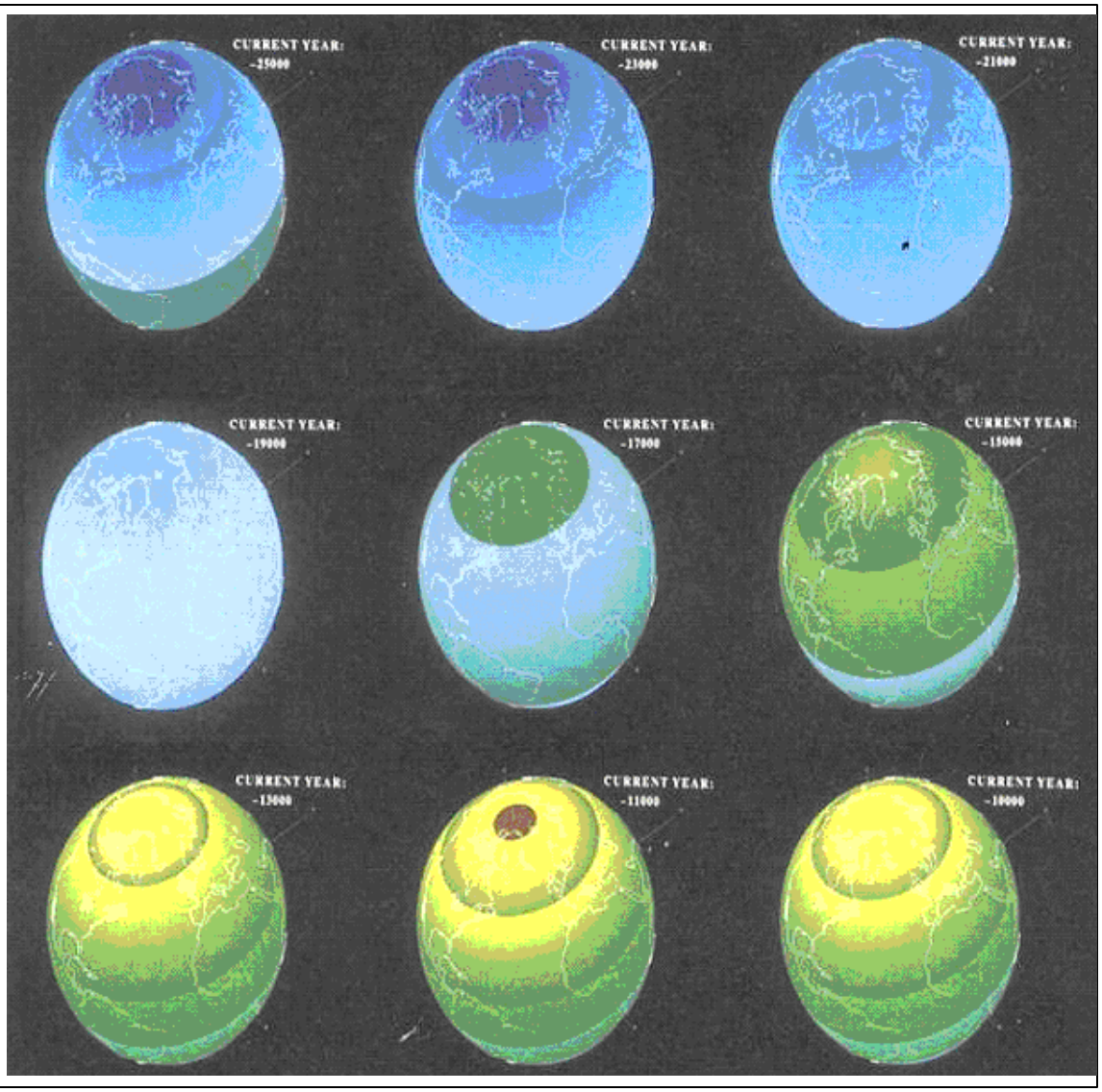

Fig. 3. Color coded globes showing change in temperature over a period of time. The globes show Earth at summer solstice from 25,000 years ago (upper left), during last glaciation, to 10,000 years ago, after the end of glaciation. Red, yellow and green regions receive more solar energy than average, whereas blue and violet receive less. Changes in Earth's rotational axis and orbital shape affect the total amount of solar energy received and thus alter the climate. [Taken from Seeds, 2003].