

Triggering Problem in the Origin of the Universe: Hindu (Indian) Mythology and a Possible Solution

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“ I want to know how God created this world. I am not interested in this or that phenomenon, in the spectrum of this or that element. I want to know His Thoughts: the rest are details”

Albert Einstein

Abstract: *The main unanswered questions in cosmological origin of the universe are: a) What was before the beginning? b) What was the triggering factor or cause that initiated with the Big Bang? Hindu Mythology provides more scientific knowledge in this matter in comparison to the mythologies of other civilizations. According to the Hindu Mythology there was limitless ocean before the beginning of the universe. A Golden Egg (so called Cosmic Egg) was formed inside this ocean, floated one thousand years and then broke into two halves through which our universe was created. Scientists believed there was nothing before the beginning and the Big Bang took place at the singularity of nothingness. Using the Hindu Mythological concept we explain: what was before the Big Bang? (i.e., the ocean of supra-physical energies); where the Big Bang took place? (i.e., inside the Cosmic Egg); the Triggering Source (i.e., the size of the Cosmic Egg). We propose that the triggering factor source of the Big Bang explosion is the lowest size of the Cosmic Egg or the Singularity equals to Φ i.e., when the condensed size of the Singularity is equivalent to $\Phi = 1.618033\dots$ it triggers to occur the explosion. The significance of our proposed model is that: it explains the presence of golden ratio everywhere in every living as well as non-living objects as a relic of creation moment -a universal footprint of the golden flow originated at the creation moment of our universe.*

Keywords: Cosmic Egg, Hiranyagarva Sukta, Golden Ratio, origin of universe, Big Bang

1. Introduction

It is human nature to be curious about how things began i.e., the question of the origin of all things including the origin of the universe. We certainly know that our universe exists. But this knowledge has not satisfied the mankind's quest for full understanding the universe. Scientists and Philosophers have applied their knowledge to an understanding of just what the universe is i.e. the origin, evolution and fate of the universe. Ultimately, this curiosity has led many questions. One of the most important unanswered questions is the origin of the Universe i.e., from where our universe was originated? From the ancient time men are curious about the origin of the Universe i.e. how, when and why has the Universe come into existence [1, 2]? Philosophers and scientists have applied their knowledge to an understanding of just what the Universe is i.e., the origin, evolution and fate of the Universe. Ultimately, this curiosity has led us to face the following questions: How did Universe begin? How did matter come to exist? Why we are here? and so on. The ancient cultures like Greek, Egyptian, Iranian, Indian, etc. are obsessed with different theories on the creation of the Universe. Their proposed various cosmological accounts are sometimes mythological and much more scientific.

Regarding the theory of creation of the Universe it persists in the Vedic and Post-Vedic literature in India[†]. In particular the Vedic thinkers were aware of the philosophical problems of the origin and nature of the world [3]. For example, hymns in the Rig-Veda reflect the cosmological ideas but they do not represent any generally accepted theory / model to the origin of the Universe. However, the biggest optical

telescopes help us to reach out through the depth of space to a distance more than 10 billion light years while Giant Radio Telescopes (such as Parkes Radio Telescope [4] in Australia, GMRT [5] in India, etc.) enable us to observe celestial objects up to 15 billion light years distance. Observations through these telescopes indicate that our known Universe consists of a billion swirling galaxies, each containing of a hundred billion stars which are each distinctly different, neutron stars, pulsars, quasars, black-holes and other exotic celestial objects, etc. Electromagnetic radiations i.e. light emission from these objects informs us about their temperature, mass-radius, chemical composition, motion and so far the observational data, measured parameters, neutrino signals from these objects provide us the collective information of our Universe or the cosmos. Based on these various models of the Universe have been proposed. The popular models are:

a) The Steady State Model [6, 7]–

In this model the number of the galaxies in our Universe is constant. The new galaxies which are forming continuously are filling the empty spaces created by those heavenly bodies which have crossed the boundary lines of the observable universe.

b) The Big Bang or Eternal Inflation Model [8, 9]–

All the matters of the universe, according to this model, was present at a single place in the form of hot and dense fire ball having high temperature of $\sim 10^{12}$ K. The Big Bang was the explosion which kick-started the cosmic inflation. As a result, all the matter which was concentrated at one place scattered into space along all direction with rapid speed.

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Then this scattered matter took the shape of galaxies and stars. The phase where the universe inflates will go on forever, throughout the larger parts of the Universe.

†“The Hindu religion is the only one of the world’s great faiths dedicated to the idea that the **Cosmos** itself undergoes an immense, indeed an innate, number of deaths and rebirths. It is the only religion in which the **time scales** correspond, to those of modern scientific cosmology. Its cycles run from our ordinary day and night to the day and night of **Brahma, 8.64 billion year long**. Longer than the age of the Earth or the Sun and about half the time since Big Bang. And there are much longer time scales still”. Carl Sagan,

c) The Conformal Cyclic or Oscillatory Model [10] –

It is based on the idea that the Big Bang was not the beginning of the universe rather than a period of transition. According to this theory there is continuously expansion in the universe may stop. Then there may be the possibility of contraction. When this contraction will approach to a particular size, again the explosion will take place. As a result of this explosion the expansion of the universe will start again.

d) Ex-Nihilo Model i.e. from nothing Everything came [11] –

The idea of this model arises as an argumentative entail of the Big Bang theory. According to the Big Bang theory as we go back in time we reach a point or a state of infinite density, called singularity. This initial singularity existed at the earliest point in space-time. So, there was no time prior to this earliest point in space-time. Question arises – what was there prior to the initial singularity? i.e. how the initial singularity was created? As there can be no object having infinite density to answer this problem the idea of nothing i.e., Ex-Nihilo arises. In other word, the initial singularity must have come into existence out of nothing.

But the main required information of these models -“How did the creation of our universe initiated i.e. what was the triggering that cause the occurring of the BigBang?”

2. Big Bang Model

According to the Big Bang theory [12, 13] the universe began with a great explosion from a state of infinite density. As a staggering implication at some point in the past which means that the entire Universe was contracted down to a single point. The Standard Big Bang model describes that our Universe, which was not eternal in the past, came into being a finite time ago. In brief, our Universe, space and time have a beginning.

The essence of the Big Bang theory or Big Bang hypothesis is that all of the current and past matter in our universe came into existence at the same time of roughly 13.8 billion years ago. At this time all matter was extremely compacted into a very small ball size (point like) with infinite density and infinite heat which is called Singularity. Suddenly, this singularity exploded (reason not yet known and this problem is called triggering or initiation problem). As a result, the Singularity began expanding that we know as our universe

began. Based on theoretical calculations, experiments involving particle acceleration and high energy states, astronomical studies scientists have constructed a time-line of events (cosmic evolution) that began with the Big Bang:

The earliest times of the universe (known as Planck Era) lasted from approximately 10^{-43} to 10^{-11} seconds after the Big Bang. Due to extreme heat and density of matter (i.e., highly unstable) the universe thus began to expand and cool, leading to the manifestation of the fundamental forces of physics. From approximately 10^{-43} and 10^{-36} second the universe began to cross the transition temperatures and the fundamental forces are believed to have begun separated from each other.

Inflation epoch began with the creation of the first fundamental forces of the universe and lasting from 10^{-32} seconds in Planck-time to an unknown point. At this stage universe was filled homogeneously with high energy density and incredibly high temperatures and pressures gave rise to rapid expansion and cooling. Scientists believed that after inflation stopped, the universe consisted of a quark-gluon plasma as well as other elementary particles.

After about 3, 79, 000 years electrons combined with neutrons, protons to form atoms (mostly hydrogen) while the radiation decoupled from matter and continued to expand through space, largely unhindered. This radiation is the oldest light in the universe and constitutes the Cosmic Microwave Background (CMB) radiation.

As the CMB expanded (i.e., gradual loss of density and energy) the currently estimated temperature of the CMB is 2.7260 ± 0.0013 K or simply 3K radiation. This CMB can be seen everywhere i.e., in all direction at a distance of roughly 13.8 billion light years.

3. Creatio-Ex-Nihilo

The Latin word “Ex-Nihilo” means “out of nothing”. This means that God created the cosmos out of nothing [14]. Ancient creation myths hint that our present universe is formed from eternal formless matter [15] i.e. the dark and the primordial ocean of chaos. For example, in Sumerian myth this cosmic ocean gave birth to heaven and earth. In Babylonian myth the pre-existed chaos is made up of fresh water, salt water and from salt water Heaven and Earth are created [16]. In Egyptian creation myth a watery chaos, associated with darkness, gave birth to a primeval lotus flower or a celestial object [11]. In Indian creation myth there was nothing before the formation of the Universe. What is nothingness we do not know. But it is a state represented by the “negation” of all physical attributes, even less than a vacuum. A vacuum can still possess dimensionality and extension but nothingness would have no extension, no structure [17]. This is the vast limitless ocean-still, tranquil, without a ripple, without any movement, without even the slightest disturbance, silent, quiet. As if it is not there, it is not noticeable, not discernible and not describable. This limitless ocean is “Brahma” [17].

4. The Hindu Vedic Theory of the creation of the Universe

Thousands of years old Hindu Vedas are the sacred text of Hinduism [18]. The Four main Vedas are: Rig Veda, Sama Veda, Yajur Veda and Atharva Veda. Puranas, Upanishadas, Srimada Bhagavat Purana and Vayu Purana are also considered as part of Vedas besides 4 main Vedas (all are written originally in Sanskrit). The Puranas are post-Vedic texts which contain a complete narrative history of the universe from creation to destruction and description of Hindu Cosmology. There are 18 canonical Puranas, dividing into three categories, each named after a deity Brahma, Vishnu and Shiva. In the Vedas creation is interpreted as a developmental course i.e., an on-going process, not an event. Creation picture



Figure 1: The Golden Egg (or Hiranyagarva, the Cosmic Egg) floated in the water which was enveloped in darkness and a state of trance. Whole universe was inside this Golden Egg but was lacking of life. (adopted from ref [17] and Wikipedia)

paints in the Purusha-Sukta of the Rig-Vedas as an ideal Primeval Being existing before any phenomenal existence. He is conceived as a Cosmic Person with a thousand heads, eyes and feet, who filled the whole universe and extended beyond it. Our world is only a fragment of this divine reality.

In the Rig-Veda, the Vayu Purana, Bhagavata Purana and Brahmānda Purana the Hiranyagarbha Sukta is mentioned as the Golden Womb, the Hiranyagarbha, Brahmānda or the Cosmic Egg (i.e., sometimes interpreted as the Golden Foetus or Embryo) that floated in a dark void, contracted and gave birth to the Universe. Once contracted, the Golden Womb yielded to the creation process, heat or energy generated, molecules formed and they interplayed with atoms and elements and so on.

5. Concept of the Expanding Universe in Puranas

The word "Universe" in Sanskrit is "Brahmānda" which is made by joining the words "Brahma" and "Anda". The word "Brahma" is derived from the root "Brha" which means to expand and "Anda" means egg. Thus "Brahmānda" which means expanding egg [19]. In the Mythology the universe is considered as "golden egg". According to the Matsya Purana the doctrine of the birth of the cosmos was in the form of the golden egg. During the period of dissolution the universe

was enveloped in darkness and was in a state of trance (i.e., unaware of the environment), in which Lord Svayambhu [20], known as Vishnu, appeared to create the universe [21]. In Matsya Purana 2.25.30 the above situation / story about creation was described as [22]:

"After Mahapralaya (i.e. dissolution of the universe) there was darkness everywhere. Everything was like in a state of sleep. There was nothing, either moving or un-moving. Under this situation the Lord Svayambhu, self-being, manifested in the form of beyond senses. He created water first and established the seed of creation into it. That seed turned into a golden Egg. This golden Egg was swimming in that water for a year [see figure 1]. Whole universe including moon, sun, galaxies and planets was inside this golden Egg with a covering / surrounding by ten qualities from outside"[23]. The Egg was lacking of life. Then Svayambhu entered in the Egg and He is called Vishnu and after that the Egg became infused with life [24]. This Golden Egg floated in the ocean for duration of the one thousandth year. At the end of thousand years the egg broke open and divided into two halves [25]. The two halves were one of silver, and the other of gold. The silver one became our, the golden one the sky [26], the thick membrane of white the mountains, the thick membrane of the yolk the mist with the clouds, the small veins the rivers, the fluid the seas [27].

If we look into Brahma-Vaivarta Purana [28] regarding creation of the universe the nut-shell picture is (see figure 2): Lord Svayambhu i.e., Vishnu was asleep, at that time a lotus sprouted of his navel (note: navel is symbolized as the root of creation or Singularity). Inside this lotus Brahma was born. Then Brahma created our universe where we all live in. Brahma himself may be the universe as well that is the reason why the Vedic texts say Brahmānda meaning universe. According to Vedas Brahma lives for 100 years (full day of Brahma = one day + one night = 8.64 billion human years) [29] and then dies and then a new universe is born. This means that our universe is not a permanent universe, it is temporary. In day time Brahma is busy in the creation of lives and during the night all lives He created is absorbed back into him. Thousands of Brahma have passed away [30].



Figure 2: The Supreme Lord was in a sleeping condition. The universe became an expanse of water and in that Vishnu was born in the golden egg. Lord Vishnu created Brahma

with four faces and finally Brahma created the universe
(adopted from ref [17])

- So, the important facts, according to Vedas and Puranas, are:
- under asleep condition of Vishnu a lotus blooms out of his navel,
 - Brahma is born inside this lotus,
 - Brahma creates our universe and He may be the universe as well,
 - Brahma represents our universe which has birth and death, a big bang from a navel singularity,
 - Vishnu represents the eternity that lies beyond our universe, which has no birth or death,
 - Our present universe is not the first time universe has been created as thousands of Brahmas have passed away.

Before the Beginning

- It was all darkness, utter darkness, darkness swathed in darkness.
- There was nothing, infinite nothingness reigns. All around there was nothing but un-differentiated homogeneity. The infinite, in its totality, is indefinable.
- What is nothingness we do not know but a state represented by the “negation” of all physical attributes (?), even less than a vacuum (?). Because a vacuum can possess dimensionality and extension while nothingness would have no extension, no structure. There was the vast limitless ocean-still, tranquil, without a ripple, without any movement, without even any slightest disturbance. It was so silent, so quiet -as if it was not there, not noticeable. It was not discernible, not describable.
- The Cosmic Egg floated in the ocean during one thousand years.

Then

- There was a slight, a very slight disturbance. There was just a bubble, a very tiny bubble. There is a beginning -a delicate beginning. Then another bubble. Then yet another. A bubble clashes with the other, resulting there was more movement and a new entity emerged. As the bubbles multiply their interfaces continue and new entities emerged. The process continues. Where there was nothing, the cosmos came into being (i.e. Cosmic Egg broke).
- Nothing was the negation of physical entities. It was the universe of supra-physical energies. There were the first stirrings and came into motion spontaneously i.e. they caused the beginning (of physical universe) and subsumed everything. When the waves vanished in the ocean it marks the end.
- There was ocean before the beginning, there was ocean after the end. i.e., there was something before the beginning, there was something after the end. This limitless ocean is still and tranquil. This is Brahma [31].

Let us see another theory of origin of the universe mentioned in the Vedas, so called “Bindu-Visphot”. “Bindu-Visphot” is a Sanskrit term which literary means “Point-Explosion”. According to Hindu Vedas this “Bindu-Visphot” produced the “OM” [ॐ] sound. The “OM” sound has several

different meanings but the Bindu or point towards the one thing only and that’s the ultimate reality. The sound of “OM” has been interpreted as the early disturbances detected by the cosmologists (like in the form of Cosmic Background Radiation).

6. Polytrope with $n = 5$

A polytrope is a spherical, self-gravitating body in which the pressure and density (assuming) must hold a power law relationship throughout the star. Basically, a polytrope refers to a solution of the Lane-Emden equation [32] in which the pressure (P) depends upon the density (ρ) in the form

$$P \propto \rho^{(n+1)/n}$$

$$\text{or } P = K \cdot \rho^{(n+1)/n}$$

where K = a constant of proportionality and n = the polytropic index.

Polytropes are useful as they provide simple solutions for the internal structure of a star. This means that they are much simpler to manipulate than the full rigorous solutions of all the equation of stellar structure.

Introducing the dimensionless variables:

$$P = P_c \cdot \theta^{(n+1)}, \quad \rho = \rho_c \cdot \theta^n, \quad r = \alpha \cdot \xi \quad (2)$$

where P_c = the pressure at the centre of the star,

ρ_c = the central density,

α = a length constant defined as

$$\alpha^2 = [K(n+1)\rho_c^{(1-n)/n}] / 4\pi G \quad (3)$$

ξ = a new radius-like variable.

Combining equation (1), (2) and (3) we obtain Poisson equation in dimensionless variables which is known as Lane Emden equation for polytropic star as:

$$(1/\xi^2) \frac{d}{d\xi} \left(\xi^2 \frac{d\theta}{d\xi} \right) = -\theta^n \quad (4)$$

At the center the boundary conditions are

$$\Theta = 1 \quad \text{and} \quad \frac{d\theta}{d\xi} = 0 \quad \text{at} \quad \xi = 0 \quad (5)$$

As both the conditions are at the same point, they can be treated as initial conditions and for every value of the polytropic index ‘n’ there is only one solution of equation (4). The physical meaning of the solution is that the surface of the polytropic star is at $\xi = 1$ when $\theta = 0$, the density and pressure go to zero according to the equation (2).

There are three analytic solutions (i.e., $n = 0, 1$ and 5) for Lane Emden equation which have important physical meaning.

Case 1: $n = 0$, $\theta = 1 - \xi^2/6$, $\xi_1 = \sqrt{6} - 2.45$

This corresponds to incompressible fluid i.e., $\rho = \rho_c =$ constant, $P = P_c \theta$. This means that pressure vanishes at the surface but density is same throughout the star.

Case 2: $n = 1$ to 1.5 , $\theta = (\sin \xi) / \xi$, $\xi_1 = \pi \sim 3.14$

This approximates a fully convective star i.e., a very cool late-type stars (for example-M, L, or T Dwarf)

Case 3: $n = 5$, $\theta = (1 + \xi^2 / 3)^{-1/2}$, $\xi_1 = \infty$

This means that the radius of the star is infinite. In a similar manner, it is possible to show that all polytropes with $n > 5$ have infinite radii. In other words, only solution with $n < 5$ have a surface.

For physical solution i.e., if the stellar structure is approximated with a polytrope with a given index, then two scaling parameters are needed to express the stellar structure in physical units. In this article we consider two parameters-stellar radius 'r' and stellar mass 'm'. So, we may express the total stellar radius and total stellar mass, if we know the analytical solutions of the Lane Emden equation (i.e., equ. 4). The structure of a star with radius 'r' is a self-gravitating means that it must satisfy

$$(1/r^2) \frac{d}{dr}(r^2 \frac{d\theta}{dr}) = -\theta^n \quad (6)$$

It is mentioned above that the case $n = 5$ is a special as the radius of the polytropic star is infinite while only solution with $n < 5$ have a stellar surface. The two cases most interesting for real stars have $n = 1.5$ and $n = 3$ but unfortunately these do not have analytic solutions. Here it is important to mention Prof. Chandrasekhar's note [33] on the analytic solution:

- g) $n = 0$ and $n = 1$: both can be solved for in complete generality;
- ii) for all $n > 3$ the singular solution is a power law relation

$$\theta = \{ 2(n-3)/(n-1)^2 r^2 \}^{1/(n-1)} \quad (7)$$

and

- iii) another analytic solution for $n = 5$ only as a special case of Emden boundary condition $\frac{d\theta}{dr} = 0$ at the centre $r = 0$:

$$\theta = 1 / \sqrt{ \{ a + (1/3)(r^2/a) \} } \quad (8)$$

However, for $n = 5$ Srivastava [34] obtained a very interesting solution which was further highlighted by Eggleton [35]

$$r \theta^2 = 1 / \{ 3 \cot^2 (1/2 \ln r/a) + 1 \} \quad (9)$$

Using boundary condition $\frac{d\theta}{dr} = 0$ at $r = 0$ Eggleton found the Emden solutions for $\frac{d\theta}{dr} = 0$, when $r = 0$ separate all solutions into two kinds

- i) Those zero radius with a finite mass at the origin, and
- ii) Those within a finite radius having zero mass.

6.1 Polytrope solution, Ocean (of Nothingness) and creation of the Universe

As a special case, polytrope with $n = 5$ offers two kinds of solutions-one those having finite mass within zero radius, and the other one having zero mass within finite radius. The arguably useful illustrative models [36, 37] of the first kind are red giants, degenerate compact stars (white dwarf, neutron stars) etc. Arguably in the sense that these have a finite mass at a very small radius though not zero radius. For example, in the case of neutron star the weight of the material at the tip of a needle is around few tons [38]. It is very difficult for us to imagine such a real existing situation.

Now, in the case of the second kind [37, 39] i.e. zero mass within finite radius which can be useful in explaining the creation of the universe. If we consider the situation where infinite number of zero mass with finite radius kinds are present i.e., zero masses are spread in infinite radius area (which is like a ocean). In this ocean of supra-physical energies we consider single point (any point anywhere within this ocean) at which there is a slight, a very slight disturbance. These are the first stirrings and they come into motion spontaneously. There is just formation of a very tiny bubble. This is a beginning, a delicate beginning (of physical universe) which subsumes everything. Due to motion there is just a bubble, a very tiny bubble. Then another bubble, then yet another. One bubble clashes with the other. There are more movements. New entities emerge. The bubbles multiply and their interfaces continue. New entities emerge and the process continues. This is where there was nothing, the new entities arise. We can say the cosmos come into being in the ocean (of supra physical energies) before the beginning as mentioned in the Hindu Mythology. Since the creation process starts following the processes from a very slight disturbance, delicate movement, tiny bubble formation, bubble multiplication and interfacing and so on, the suitable Cosmic Egg formation (for creating present universe) through accumulation of energies from the ocean may take floating time duration of one thousand years or more. It is certain that the cosmic egg is the Big Bang singularity. The size of the cosmic egg is not a point but may be arguably treated as a point with respect to infinite size of the ocean (of supra-physical energies) as in the case of degenerate compact objects (like white dwarf, neutron stars, pulsars, magnetars) having finite mass with zero radius though practically size is \sim few kilometers. For example, in the case of neutron star a single sugar cube worth of neutron star material would weigh \sim 100 million tons or about the entire human population on the Earth [39].

6.2 BEC and Collapse state of the Universe

Bose Einstein Statistics [40, 41] predicted that at the low enough energy photons of light, so called bosons, would all enter in the same energy state, acting as one. This basic idea was behind Bose-Einstein Condensation (BEC) theory. The BEC shows that it is a self-reinforcing process, in which bosons are very gregarious and the chance of more atoms (participating in the BEC) joining is dramatically increased. If we consider a theoretically possible BEC forming somewhere within the cosmic fabric then

- a) a quantum event or fluctuation is required for the appearance or origin of the universe in Standard Big Bang Theory (SBB).
- b) Any Big Bang theory requires a pre-Big Bang starting point of unusually high density: high energy density in SBB.

This means that a quantum fluctuation in the pre-Big Bang high energy density BEC state is the possible cause of the initiation of the Big Bang resulting the creation of the universe, then expansion takes place and finally the present expansion state of our universe. This means that a quantum fluctuation in the pre-BigBang high energy density BEC state is the possible cause of the initiation of the Big Bang resulting in the creation of the universe.

Theoretical and observational studies of accelerated expansion of the present universe hint that our universe experienced the accelerated cosmic expansion phase at least two times: First one, at extreme inflationary acceleration in the early phase universe [42] and the second one, at recent mild acceleration phase [43, 44]. To explain these two accelerated phases Fukuyama and Morikawa [45] proposed a unified model by introducing BEC phases of a boson field where two phases of BEC (= dark energy or DE) and normal gas (= dark matter or DM) transform each other through BEC phase transition. According to their proposed model the inflation is naturally initiated by the condensation of bosons in the huge vacuum energy. The present inflation and the cosmic expansion eventually terminate exactly at zero energy density which is called “stagflation”. Particle production and the decay of BEC take place at “stagflation” era. As per” stagflation” scenario particle production makes our universe turn into the Standard hot Big-Bang stage while decay of BEC makes the cosmological constant becomes vanishingly small after the inflation. In other words, BEC plays a crucial role at the Big-bang scenario i.e. at “stagflation” phase [46, 47].

7. Golden / Divine-ratio Φ and Quantum Fluctuation

The Golden Ration (also called Divine ratio), denoted by Φ , represents the mathematical connection for the shape of the objects portraying from longer side to the shorter side. The value of this golden ratio (Φ) is

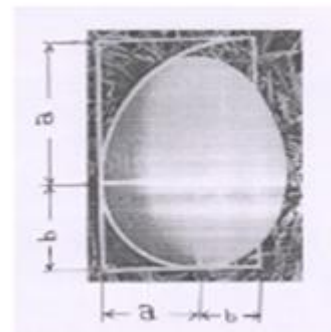
$$\Phi = \lim_{n \rightarrow \infty} \frac{F_n}{F_{n-1}} = \frac{1 + \sqrt{5}}{2} = 1.618\ 033..$$

where Fibonacci numbers $F_n = F_{n-1} + F_{n-2}$ with $F_1 = 1, F_2 = 1$.

Golden ratio in Egg is shown in side figure.

For lengths or wide sides it is expressed as $\Phi = (a + b) / a$.

This ratio can be found in almost everywhere in the universe from galaxy to particles including universe itself.



This ratio is apparently found through nature in all the objects such as the stems of plants, skeleton of animals, Eggs, whirlpool Galaxy, the shape of Nautilus, shells, Hurricane, distribution of planets, moon, asteroids, rings of the solar system, geometric shapes of the universe, etc. Scientists believe that the reason behind this ratio Φ is so ubiquitous that it is actually a property of space-time.

The plot of ratio $F_{(n+1)} / F_{(n)}$ where $F_{(n)}$ is the nth Fibonacci number with the formula

$$F(n) = \frac{\Phi^n - (-1)^n \Phi^{-n}}{\sqrt{5}}, \text{ golden ratio } \Phi = \frac{(1+\sqrt{5})}{2} = 1.618;$$

$$\Phi^{-1} = \frac{1 - \sqrt{5}}{2} = -0.681$$

and

$$\frac{F(n+1)}{F(n)} = \Phi - (-1)^n \frac{\Phi + \Phi^{-1}}{\Phi^{2n} + (-1)^{n+1}}$$

is shown in figure 4. This shows that $F(n+1) / F(n)$ is below the golden ratio when n is odd and it is above when n is even. Thus this ratio Φ oscillates i.e. it creates oscillation and then converges to $\Phi = 1.618033....$ This means that change in ratio $[F(n+1) / F(n)]$ also indicates a change in the size of the Egg, which creates oscillations some where inside within the material of the Egg. As the oscillation converges to golden ratio, so the material, after Big Bang explosion, tries to maintain the $\Phi = 1.618$. As rhythmic property.

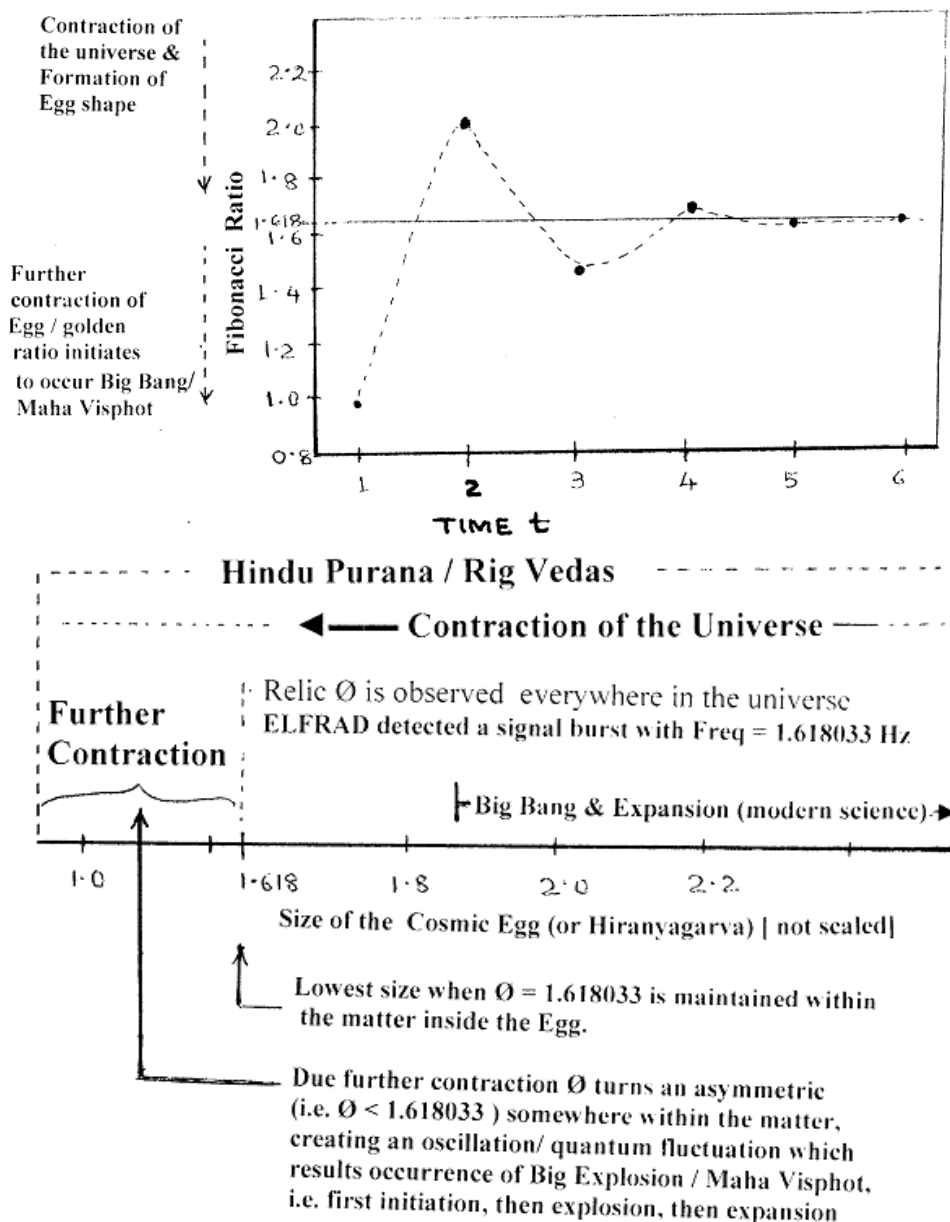


Figure 4: A schematic diagram showing (below) the condensation of the universe towards the singularity. When the lowest stable size of the Cosmic Egg or Singularity forms (maintaining Φ) then oscillation arises somewhere within its interior (above). This oscillation creates un-stability inside the whole stable Singularity or Cosmic Egg and finally explodes.

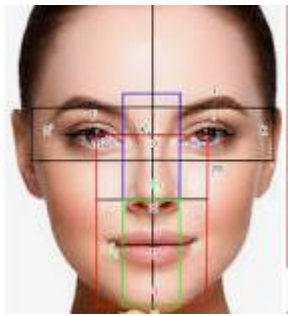
8. Evidences of Golden ratio exist in micro- and macro- scales

Golden ratio $\Phi = 1.618033.....$ is observed everywhere i.e., in micro-scale (e.g. RNA, DNA) from living organisms on earth to macro-scale (such as stars, galaxy, black-holes) in cosmic objects [48]. The arrangement of atoms in a molecule (and also its shape) are determined solely by the physical laws that were established at the origin of the universe. Unlike the inanimate world, micro-scale structured life also needs to store and process information. At a cellular level these information includes how to construct and then regulate the time and quality of enzymes and other biomolecules for many complex biochemical processes, controlling the fluxes of reactants, and products via the cell membrane. For example, one third of the Universe's history i.e. $\sim 1 \times 10^{14}$ bacterial generation reveals the fact that DNA has acted such a storage system transmitting this information

with high fidelity [49 – 51]. But over the time, the structure of DNA remains unchanged [51]. With the improved model of DNA it is not yet cleared to what extent (with greater precision) DNA might show structure (s) with ratio convergent towards $\Phi = 1.618033.....$ However, the study of B-DNA, the informational molecule for life on earth, appears maintaining golden ration in its structure [52].

8.1 Golden ration in Living Beings

Golden ratio exists in the human whole body from face to leg, eyes, mouth, teeth, lips, hands, abdomens and others i.e., everywhere we can see the golden ratio. In particular, the beauty of facial structure



Expresses the closeness to the value $\Phi = 1.618033\dots$ (see the figure). Beautiful smile even shows a link of golden ratio between lips and teeth. Not only in human, from invisible virus to ant, honey bees, biggest animal giraffes, heaviest elephants body structures of all of them maintain the golden ratio.

In plants the distribution or arrangement of leaves on a stem and repetitive arrangement of petals, seeds, florets and branches also qualify the golden ratio.

8.2 Golden ratio in Non-living Objects / Systems

8.2.1. Alloy System

Golden ratio relationships are found at the key points of phase diagrams of copper-zinc (Cu-Zn), copper-tin alloy (Cu-Sn) and iron-iron-carbide ($\text{Fe-Fe}_3\text{C}$) alloy systems. Ahmad [54] found in his investigation the ratios of proportions of Cu-Zn and Cu-Sn at key points in their respective phase-diagrams are associated with golden ratio. In the case of iron-carbon alloy they also found the concerned key point in $\text{Fe-Fe}_3\text{C}$ phase diagram are linked with one another through golden ratio.

8.2.2 Solutions of Characteristic Equations applied in physical system

Study of certain characteristic equations, in particular, the solutions of few polynomials can be used to investigate the dimensions of flora and fauna, animal faces that are found in the natural world. For example, the general form of polynomials with even function produces at least two golden ratio solutions [55] in which (see fig.6: owl face with superimposed graph of two polynomials in ref [55]) there is at least one axis of symmetry (e.g., the face of owl has a striking symmetry) such that each pupil of the eyes intersects at the same horizontal and vertical scales. The second example is the dimensions of a leaf in which case the solutions intersect at the junction of the veins and midrib (see fig.7: leaf with superimposed graph of two polynomials, ref [55]).

8.2.3 Fluid Dynamics and Vortex merger in cyclones

Fluid dynamics phenomena observed in nature play an important role when merger of two equal size vortices of the same orientation arises. The prototype of the vortex merger observes in large scale atmosphere or oceanic flows when Hurricanes or cyclones sometimes appear in pair. Based on numerical simulation and available experimental data Mokry [56] found presence of golden ratio in two identical Rankine Vortices produced, presumably and fortunately, due to their relatively short lives and large separation distances w.r.t. their sizes although their study devoted to vortex merger of

two identical vortices (symmetry merger) in two dimensional flow.

8.2.4 Large Scale Structures-Galaxy, Black holes

Galaxy is the large scale structure (i.e., macro-scale) cosmological object in the universe. Golden ratio is also appeared in their structure (see fig.5). In a study of measured data for more than 15, 000 spiral galaxies (at Sloan Digital Sky Survey) Longo [57] found that large scale spiral galaxies would exhibit themselves as a dipole (i.e., example of symmetry).



Figure 5: Spiral galaxies observed by Hubble Space Telescope (Credit: NASA)

Blackholes are such peculiar objects with very strong gravity. It possesses sufficient strong gravity that even light cannot escape. Several studies of black holes have revealed multiple instances of the Golden Ratio i.e., Φ also appears in black-hole physics, particularly in certain theoretical treatment of black holes [48, 58].

8.2.5 Universe itself a golden universe

In searching a relationship of the time-scale Fibonacci sequences in modeling the universe Postavaru and Toma [59] found the time scale Fibonacci sequences satisfy the Friedman-Lemaitre-Robertson-Walker (FLRW) dynamic equations, i.e., the model which describes the expanding universe, on time scale. As the FLRW model is an exact solution of Einstein's field equation of general relativity for describing an expanding, homogeneous and isotropic universe they showed the same dynamics for both the continuous and the discrete universe for a certain granulation i.e., the expansion of our universe follows golden rule on time scale.

Considering the hyperbolic Fibonacci and Lucas functions (which are based on golden section) Stakhov and Rozin [60] proposed a "golden" hyperbolic model of our universe which has a surface of the golden shofar, the representative of the golden mathematical model.

The "golden" model of our universe, thus, raises a question: "Is the golden ratio for self replication? [61]". If we consider the present stage of the universe shows the follower of golden ratio might be present at the time of birth. Inversely, if the golden ratio were existed at the birth phase of the universe, then our universe should follow the "golden ratio"

that might be continued and be observed at present time (that we see everywhere now) and in future also. As the “golden ratio” is observed presently in all living and non-living objects everywhere in nature from micro to macro scales [62] one can say-“golden ratio” had present at the birth phase of our universe and played an important role in creation and evolution of the universe.

9. God, Divine Architect and sacred Geometry

Whenever something is created, creator’s signature or finger-prints must be reflected within the created object through direct or indirect symbols in the form of design’s beauty or hidden mathematics (or geometry). Design’s beauty or structure means, in mathematical language, numbers, proportions as well as (sacred) geometry. For example, if we look into the entire universe i.e. from atoms, DNA, RNA to solar system, galaxy, blackhole....)it reveals the secrets of balance, rhythm, interconnections among them and even also as a whole. Regarding the mathematical beauty or connection of number and universe Nicolas Tesla expressed -“ if you only knew the magnificence of the 3, 6 and 9, then you would have a key to the universe”. Per haves, by number 3 he wanted to express the three minimum things i.e., energy, field and consciousness. So, “nothingness” exists in our physical universe means it is

outside of energy and field Only then one can have consciousness to check a material existence.

Regarding “fine tuning” Arthur Eddington [63] conjectured the fine structure constant i.e., $1/137$ is a dimensionless physical constant and its mathematical beauty is it reciprocal is also, in fact, precisely the integer 137. Not only that, the experimental values for the fine structure constant is very close to 137.036. This led the astronomers and scientists to be convinced on universe’s structural beauty or grand design nothing but a number. This means without observing God we can found the creator’s finger-print through a number.

Earlier people in various societies seeking the God modeled their realms on the Divine Architect’s “sacred geometry”. This was the reason we find ancient sites were astronomically oriented as well as their architectural designs well based on the principles of the “sacred geometry “of nature. In other words, the “sacred geometry” could unfold: a) the dimensions of the universe (i.e., beautiful cosmos) b) the hidden wisely designing and c) proportion’s evidence in the geometric shapes and processes of nature [64].

In table I we show various observational facts on the basis of theoretical and mythological aspects.

Table I: Various models and their scientific and mythological views

| Theoreticall /observation based model | Possible resulting effect | Observation / observed facts | Scientific view | Mythological view | Number used |
|---|--|--|--|--|-----------------------------|
| BEC condensation of our universe | Formation of hot, dense fire ball, with temp. $\sim 10^{12}$ K | Explosion might occurred under such extreme conditions | Situation is suitable for explosion certainly | Formation of one Golden Egg, floated one thousand years, being matured condition for explosion | 1 |
| Explosion occurred inside the Singularity. | Cosmic Inflation | Kick started, matter scattered into space along all directions with rapid speed. | Hubble observed galaxies are moving away from each other [65] | Golden Egg exploded, divided into two halves | Explosion – 1 Division-2 |
| Cooling (took place due radiation) | Cosmic Microwave Background (CMB) might be present | 3 K radiation detected by Penzias & Wilson [66] | Presence of electromagnetic radiation era | Formation of things | 3 |
| Model of observation of Φ everywhere in micro- and macro-scales. | Controlling the rhythms of life in living of organisms | Appearance of nature’s beauty both in living and non-living objects | Animal vision might have involved a certain horizontal ratio (i.e. Φ) to scan nature effectively suggested by Bejan [67] | Seeds of God’s grand design | $\Phi = 1.618033....$ |

Observation of 3k radiation indicates the cooling era and definite cosmic inflation phase that our universe had crossed. This also provides a certainty of occurrence of Big-bang in the past. Observations of Golden ratio $\Phi = 1.618033....$ in every objects, say from black hole, galaxy, to RNA, DNA hint that these are not a human construct, it was a signature of God, His expressions, thoughts as evidence that everything was created by an super-extraordinary skill-full hands. We propose that Golden ratio is the cause of Singularity (i.e. Big-bang) or Golden Egg (Hindu mythological) explosion such that we observe everywhere as a relic finger-print signature of that moment of explosion, not a result of evolution [68].

10. Conclusion

The Big Bang theory consider that at the beginningof the universe was in a very high density state i.e., the whole mass of the universe was concentrated on a point or an a primitive atom which is so called initial singularity with zero radius and time (i.e. $r = 0, t = 0$) and infinite density. It’s explosion was the beginning of the expansion that formed our present Universe. This is the most acceptable version of the modern cosmology which indicates the Universe, Space and Time have a beginning [69, 70]. Early Christian Church supports the idea of Ex-Nihilo (not Being) which suggests that creation of the world through non-being or nothingness [37]. Greek Philosopher Scientist John Philoponus [38] argued that “the non-being does not represent nothingness but some-thing beyond space and time, which is inaccessible to

human senses. Thus, a philosophical question arises - Whether the Universe has a beginning? Whether its creation as a transition from the “non-being” to “being”: Modern Astrophysics and Contemporary Cosmology support the hypothesis -“Existence of the vacuum which is our imperceptible before the Big-bang”. Here argument in philosophical and scientific point of view about the Big-bang is very important [39, 71]. In the past the entire known universe was contracted down to a single point (called Big-bang Singularity) which reflects the fact of a state of “infinite density” and according to the Bigbang theory our universe began with a great explosion from that state of infinite density. So, “infinite density” is not synonymous with “nothing” and the initial singularity is not simply nothing at all. “Being a point” the initial singularity would therefore be marked “something”, not a mere “nothing”. Not only that, the creation, based on the idea “something” instead of “nothing” Grunbaum [72, 73] has called the creation of the universe as a transition from the “non-being” to “being” or a transformation cause-a cause that shaped something that was “already there” [72, 73]. Regarding vacuum and nothing the vacuums are full of “virtual particles” [67]. When real particles left or removed from a region of space, the remaining space is not empty, but full of virtual particles [74]. According to De Witt [75] in classical physics the vacuum is flat, empty space-time. The classical vacuum is featureless. On the other hand, in quantum physics a vacuum is much more complex entity i.e., a vacuum is not exactly nothingness but is teeming with quantum particles that fluctuate between being and nothingness [76]. Finally, these quantum tiny particles can come into existence for a fraction of a second before they annihilate each other, leaving nothing behind. Physics of quantum gravity hints that a true vacuum can exist only if the curvature (of space) is independent of time only. Once the curvature is time dependent then it is no longer a vacuum and the particles generated by the time-varying curvature appear randomly. It is not possible to predict in advance exactly when and where a particle will be born [76, 77]. Considering the above mentioned mythological, philosophical and modern scientific views it can be said that before the Big Bang there was ocean full of supra-physical energies.

Due to spontaneous fluctuation in the ocean bubble formation took place which ultimately turned into Cosmic Egg. This Cosmic Egg accumulated energy from the ocean and turned into appropriate size and then broke into two halves (similar to the Big bang explosion) which finally gave birth earth, sky and other heavenly bodies (that are observable in our present universe). Time taken for the formation of suitable size of the Cosmic Egg from the bubble may be one thousand year (as per Hindu Puranas) or more which requires further study (for knowing the exact time period). It is certain that before the Bigbang there were something, which is nothing but the ocean of supra-physical energies. Time dependent curvature was the main responsible factor for creating the bubble that finally turned into Cosmic Egg or Golden Egg or Hiranyagarbha which floated for one thousand year (as per Hindu Mythology) for making suitable size (i.e, condensed form) and then divided into two halves (i.e., similar to Big bang explosion) took place. So, it can be said with certainty that “Time” began

much more earlier prior to occurrence of the Big-bang explosion (not at the moment of Big-bang explosion).

There have been arguments to explain the real reasons behind the existence of the Golden ratio Φ . For example, Stenger [78] proposed a mathematical model based on established physics and cosmology that the scenario Φ appeared as a natural origin of our universe. Hosinski [79], Such [80] indicate a way to solve the problem of “existence of nothingness” through extrapolation of local physics on the large scale areas of the universe.

But the golden ratio is observed in timing, non-living objects, matter in many natural and living phenomenon. Not only that, it is also observed in the physics of universe. We thus propose that the Golden ratio is a relic scenario of creation moment, the finger-print of the creator, a universal foot-prints of the Golden flow originated at the creation time of our universe through Big-bang explosion and that spread in everywhere, every living and non-living beings.

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