INDIAN COSMOLOGY AND THE UNIVERSE OF EINSTEIN & STEPHEN HAWKING

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Abstract

Bharatiya or Indian cosmological postulates are enshrined in Brahma Vidya which encompasses two way realization of Ultimate —journey to inner universe or adhyatma, outer journey to physical cosmos or brahamand. Bramha and brahamand have been declared synonymous in discourses on brahmajigyasa session in upnishadas.

Indian cosmology has discussed beginning, plurality or singularity, constituents of universe. Principles of counterbalancing between evolution and involution, ordered and disordered state of the system in terms of Trigunmayee Prakrati, anthropic principle, scientific determinism and uncertainty Travel in Time, besides question of assigning consciosness to physical universe.

Einstein's dream to have single untied theory to explain both the microscopic and macroscopic universe is found fulfilled in Bhartiya cosmology. Indian cosmology rightly answers Hawking's all speculations-who am I ? what is the purpose of universe? And also his quest to understand the mind of God.'

Solving problem by solving its immediately preceeding cause so dear to Western science has failed in cosmology which demands study of its root cause first as Indian cosmology has done. Application of Indian cosmological principles to modern cosmology, therefore, will be leap forward in time.

Cosmology is the study of universe as a whole.[1] It therefore includes not only macrocosmic intergalactic universe as is popularly believed. It also covers the microcosmic universe which is fundamental to the constitution of matter with which the observable universe is madeup of. What is the nature of universe, has been deliberated upon by the theology and science - the philosophers of science and the philosophers of religion both. Scientist-philosophers explored nature of physical universe and human's place in it, through theories which give predictions which could be verified by all. Philosophers of religion, on the other hand relied upon intuitive predictions verifiable by sell only. Science has remained too much occupied with the question of what the matter and the material universe is whereas why it is so has been left to the domain of philosophers.

However cosmology is such field of inquiry where such divided pursuits has so far yielded little result; cosmology therefore. requires a fusion of both streams of quest. In this paper it is my endeavour to establish that how the 'outward inquiry' of physical cosmology can be better perceived with the inward inquiry of Indian cosmology as stipulated in Brahma vidya of Vedas and Upanishadas. Such joint venture may also pave the way howsoever little, in exploring the theory of every thing' which was Einstein's dream also.

Divide and rule method of science does not work in cosmology

In our quest for understanding the visible astronomical system we have evolved some physical laws which seem to operate well for a specific frame of reference but why by the things are so is nut answered by such law. For example Newton's law of gravitation accounts for Kepler's three laws of

planetary motion but not for the fact that the orbits of planets are nearly circular or nearly coplanar. These aspects of solar system are outcome of an evolutionary process, the outcome depends on what the primordial solar system was like. It, therefore, follows that to understand why the things are so as they appear, we will have to reverse the order of and trace out root cause first. 'The strategy divide and conquer' so fruitful in other branches of science is useless in cosmogony, the study of cosmic evolution"[2] because in the case of cosmology it is like tracing root of tree from counting leafs and branches. Even tracing the root is not sufficient, the environment which nourished and sustained the root till its fructification all need to be explored to understand the tree as it stands before us.

This botanical simily akin to decoding human features from DNA equally applies in exploring physical universe. That is perhaps why Kath Upanishad[3] terms cosmos as eternal tree but with a difference which makes a great difference its roots are upside and branches downward, the message is clear root is the cause of fall manifested branches of this visible cosmos trace it first rest will he known untoyou:

Oordhva moolo awaakshaakh aeto ashwatthah sanaatanaah

Physicists are now turning attention to the root cause of universe. Stephen Hawking the greatest physicist after Einstein, wonders why the universe is there, why we are here and where we came from?[4] Is such orientation of cosmology towards root cause ia new development and what has been its course of enquiry so far and where it stands in 21st century? Let us have a quick over view.

Pre Ensteinian universe of the west

Claudius Ptolemy (around 150AD) developed a model of visible universe over the fixed earth. In 16th century Nicolus Cpernicus (1473-1543) revived sun centric model developed by Aristarchus in 300BC. Which was further improved by Johannes Kepler (1571-1630) from observational data of Tycho Brahe. A mathematically harmonious model of universe was thus evolved and modern cosmology began with Copernicus and Kepler. Galileo Galilei (1564-1642) expanded the horizons with his telescope and also with his fight against Catholic Church which found sun-centric universe against Bible. Isaac Newton (1642-1727) with his universal gravitation added a new dimension. But Newton also projected a deterministic view of universe like a clock. In scholium chapter of his Principia Newton observed: 'Absolute space in its own nature, without reference to anything external, remains always similar and immovable; he also viewed time is also absolute always the same at every point of universe, never changing.[5]

Immantial Kant (1724-1804) astronomer-philosopher with his philosophical insight putforth the idea that the astronomical universe is a hierarchy of self gravitating system: simply put .each planet or star is held together by their mutual gravitational attraction and revolving around their center of mass as per Newton's laws; planets are revolving around the sun, sun around galaxy, galaxy around another galaxy and single and double stars assemble in one group. This multi-galactic universe inference from limited observational data was unique as it was expanding the finite universe intoinfinity as visualized by Geordano Bruno (1518-1600) who as sentenced by church for holding that universe is infinite. Near infinity view was recognized after hundreds of years when Hubble established (1929) that some of the clusters actually were galaxies and that they were moving away from us with a speed propotional to

their distance from us. This further expanded the limit of our observable cosmos.

The dawn of relativity

Newton's view that space and time are absolute remained mostly unchallenged until Einstein. Mean while Irishphilosopher George Berkele pointed out that if there was nothing in space around a rotating body, it can't he seen as rotating. This view was later developed as Mach's principle by German physicist Ernst Mach who postulated what would happen the centripetal force if all the other matter in the universe sudden disappears. It meant local forces had to depend not only on a local thing hut on the universe as a whole. This was a revolutionary concept establishing interrelatedness of the universe but in Europe 'People laughed' writes Bary Parker 'how could distant stars have any thing to do with the force you feel when you spin? But Einstein spent several years considering its consequences and he later referred to it as a guiding light in the formation of general relativity.[6]

Einstein's universe

In 1905 Einstein postulated his special theory of relativity showing how objects move through space and time and that time is not absolute but joined with space making space-time continuum. In this continuum future and pas are just directions of time like up-down left-right and it can have different rates to elapse at different situation. This was a revolutionary shift from classical mechanics. In 1915 Einstein made another revolutionary change in the concept of Newton's gravity by theorizing that gravity causes curve both inspace and time due to energy-mass of matter. The earth is trying to move on a straight line through space-time, but the curvature of curvature in space-time produced by the mass of the sun causes earth to go in a circle around the sun and so also light is deflected around the sun. The 29 May 1919 total eclipse of sun proved the prediction correct that light is deflected near the sun.[7]

Indian view of Origin of Universe

Astronomy in ancient India was part of the six disciplines called Vendanga. These disciplines of knowledge have been termed as Apara Vidya i.e. inferior or secondary knowledge whereas Brahma Gyan or realization of supreme consciousness has been termed as Para Vidya or superior or final knowledge.

Here we enter into the field of cosmology wherein the question of the origin and evolution of universe is attempted to he resolved. It was released much before, that these questions can not be treated with the help of the same principles meant for material universe. The science of cosmology in Ancient India, therefore, was developed as an integral part of the higher knowledge called Para Vidya or Brahma Vidya or spiritual science. For delineating the cosmological concepts of Ancient Indian Astronomy, therefore, we will have to scan through Upanishadas. Nasdiya Sukta of Rig Veda, six atheistic and six non-atheistic philosophies and to some extent other Shastras and Puranas

Of late there is an awareness seen in Western physicists also that the theories propounded with the aid of present physical laws can not comprehend the "frontiers of early universe where particle physics and Cosmology meet and join". In the wake of this feeling, the need to study the Ancient Indian Cosmological concepts has become an imperative.

Now coming to Indian view, we find that Kapila of Sankhya philosophy holds that there is no actual creation. It is just an unfolding of the Avyakta or undifferentiated form of Prakrati i.e. Nature. When nature is in the state of involution, it remains in the state of equilibrium. Sankhya philosophy says that

the Prakrati is Triguanamayi-nature has threefold attributes or forces: Tamas i.e. attraction - it is the lowest of forces: Rajas or repulsion - a little higher and Satwa or the balancing force which is the highest forces. Kapila further postulated that so long as there remains counterbalancing of the two forces i.e. so long as Satwa guna rules, there is no creation. This is what we call "Adhytma Bhava" the stale of quietness or submergence. This is pralya. Then the equilibrium is disturbed, motion sets in, and the nature starts unfolding itself. This is "Bhoot Bhava" Bhootas means the outer coverings of matter.

Thus "the whole universe", to quote Swami Vivekananda, "is a case of lost balance.

All motion is the struggle of the disturbed universe to regain its equilibrium".

The matter is made of fivefold basics - it is made up of 'Panchamahabhootas'. Out of the five, the Aakasha or space always exists - it being the outermost coat. It is the first element of Sankhya universe and it is eternal. Similarly, the primal energy "Prana" also exists along with Aakasha, Prana and Aakasha with mutual action create various elements. This Aakasha is also of three kinds:
Bhootakaash - enveloping the physical universe.
Chittaakaash - the seat of sensible world and
Chidaakaash - the chaitanya, it transcends bhoota and chitta both. This is consciousness, no wave of bhoota, and no perturbation of senses. Herein dells the Ultimate. Goswami Tulsidas poetically adores this ultimate in the form of Lord Shiva who dells in this chidaakaash in his Rudraasthaka:

चिदाकाषमाषवासं (रुद्राष्टक: उत्तरकाण्ड)।

In Vedanta philosophy, Sankaracharya's Vivartavada gives prominence to Adhvatmabhava or equilibrium aspect. Whereas Parinamvada of Ballabhcharya and Vishishtha Advaita of Ramanujacharya prefers the Bhootahhava or dynamic creative aspect in unfolding the nature of' the universe.

Shaiva school while synthesizing both the Bhavas or States has symbolized oval linga as immovable at the center representing unchanging Adhyatmabhava; and dynamic Bhoothhava or Prakrati as serpent power coiled around it.

Swetaswater Upanishada analyses all possible causes while enquiring the first cause of the universe: 1. Time or Kaal, 2. Swabhava - the natural potential power of matter, 3. Karma, 4. Yadrichha or Causality and 5. Jeevatma - living being. It declares that all are inert (Jada) hence not capable of activating themselves independently. It declares that all these causes are governed by Brahman so Brahman is the first cause of the universe.

Rigveda (mandal 10) gives a poetic account of the origin and the cause of the universe and also about what was before all that - in its famous narrative called Naasdiva Suktas:

प्रश्न : नासदासीन्नो सदासीत्तदानीं किमावरीव तमआसीत्तमसा गूढमग्रेअप्रकेतम्

उत्तर : आनीदवातम्

When there was no spirit no matter, when the darkness was shrouded with darkness – what then existed?

The Omnipresent, Omnipotent dwelt, then, in an equilibrium or quieting state.

The problem with modern science however, is that it wants to comprehend every thing in a fragmented way in its lab controlled by the five senses. But in the study of universe this fragmented view can not work. We are well aware that Newtonian mechaistic which works for average conditions does not work in the study of micro world of particles physics and also macroscopic world of galaxies. Two different sets of outlooks quantum and relativistic outlook respectively have been evolved for the study

of the smaller and the bigger universe of material world. Similarly for the combined study of this entire universe or cosmos or brahmand consisting of both the micro and the macro-scientist world over realize that a fusion of both the outlooks called unified field theory is required. The task of conceiving and delivering such unified theory, a single theory which can explain everything can better be achieved if we give due attention to the cosmological concepts of ancient Indian wisdom.

The ultimate conclusion of Indian cosmology is that visualisation of' the universe through mind is not possible because mind is Jada or inanimate. There is only difference of the degrees of vibration or "mixing of electronic system in the chemical system". Mind can become matter and matter can become mind. After all man is made up of, to quote Harlow Shapley, the elements found on the crust of earth and on stars. That is why Arthur Eddington says that the world stuff is the mind stuff.

In ***Deegh Nikay*** Buddists have conceived an object as an event in terms of time and movement. That is why mind has also been termed as ***Kriya***.

Swetaswater Upnishada visualises a Brahmad Chakra former of matter and mind etc. with "ignorance at its nucleus". The universe has also been compared in it with a river emanating from five senses. This physical universe is therefore, a creation of mind and when mind is subdued and submerged in Satwa, the physical and sensible world cease to subsiet.

It is said in Ishavasya Upanishad that the Truth is covered with an illuminating veil ***Hiranmay paatren satyasya apihitam mukham.***

This veil is nothing but various conditionings of mind so to say in the words of J. Krishnamurthy accumulated in our mind over several life cycles and unless we free ourselves from all sorts of knowledge stored in mind and stop searching with a preconditioned mind - we can not see the real state of universe which simply exists-'asti' in the opinion of Shrimadbhagavata Purana.

As for the creation of matter, Vyasa says that evolution of matter is *Jaati Bheda* i.e. differentiation which sets in with the involution. He further observes that in every matter or so to say in every element all the other elements remain submerged- 'sarvam sarvatmakam' सर्वम् सर्वात्मकम् because nature is homogenous and it is differentiation which manifests itself as nature which we call creation or universe.

The idea of wholeness, causality and the principle of 'Leela'

Fred Hoyle in his highlights in Astronomy observes that the portion of the universe studied so far is a tiny element of the whole. Despite this we continue fragmenting the tiny portion itself.

Fritzof Capra in his ***Turning Point*** feels that the classical science as constructed by Cartesian method of analysing the world into parts according to the causal laws gives a deterministic picture of the universe. Quantum theory on the other hand has shown that the whole determines the behaviour of the part and that it can be summaried not within strict cause and effect rule but in statistical causality.

The Causality Question

The classical science applied the Cartesian method which viewed the word as a perfect machine and was dominated by causal laws. This gave a deterministic picture of the universe. But Werner Heisenberg's principal of indeterminacy or certainty which was the direct consequent of quantum theory started changing the picture. Quantum theory tells that it is not the part but the "whole" which determines the behaviour of the part which can not be summarized within the strict cause and effect rule.

That was Cartesian method of analyzing the word into parts. But after the development of particle physics, the uncertainty principle is no longer confined to quanta or micro world it is increasing being applied in the study of galactic universe also. There is also a growing awareness that the universe is an undifferentiated whole. This is what Indian Cosmology declares. What is this wholeness ? This wholeness is "Bhooma", Yo Bhooma Tad Amratum. It is the greatest of great called Mahantam in Upanishad:

Vedahmetam purusham mahantam...

This bliss of wholeness can not be perceived in stages, it simply descends instantenously..

Gargi, in the Dharma Sabha standsup posing "two arrows of questions" before Yajyavalkalya. It is pertinant to note that these questions upon which rested the decision of the contest on Brahma Vidya, relates to the physical universe in Brahat Aaranyak Upanishad.

In what does the one, who is above the cosmos and beneath the cosmos; pervade?

That it pervades in the pathogenic universe i.e. Vyakrit

Thereupon Gargi bowed to the sage and asked the second question.

In what does the universe prevade?

- It prevades in Brahman.

Similar questions between Bhrigu – Varuna, Nachiketa – Yama, Paippal – Jabali, Yajyavalkalya – Ashval all reflect the nature of universe. In all these idea of wholeness is dominating.

Causality and western physicists

Now coming to the point of causality it is seen that physicists seem divided over it. Sir James Jeans has observed in the mysterious universe that the steady onward flow of time is the essence of the cause and effect relation and inclusion of time in three dimentional space, as a fourth dimension. It can possibly abolish the determinism and law of causation. Einstein on the other hand believed in causality and he had remarked that God does not play dice.

Sankhya view on it is that of strict cause and effect but at the time involution, space-time and cause-effect all remain in dormant state.

But this is as a bad design with no place for the omnipotent to show his existence because every thing is determined. So despite repetition of the universe in each kalpaas per cause and effect rule, there occur some variations within the frame of each Kalpa. These variable patterns may be theorized as blissful play or Leela.

Those who hold Karma as the binding down mechanism of the universe give the word Karma a wider meaning the "Karma of Leela". So karma is the active principle of Leela. It is that dynamic force which generates Maya or the physical world. It is the interchangeability of matter and energy in Einsteinian world.

TIME

Time slows down in motion, so an object in motion will comparatively last longer. Similarly, if matter disappears time will also disappear. These two postulates of relativity also find place in Sankhva Universe. When it is in quieting state in Satwa Guna, not in motion, and the material universe shrinks in a subtle state, time also Shrinks. Time is a condition for the transmission and space for the vibrating matter. The onward flow of time appeal's due to interaction between particles. Since particles can move backward and forward in time so onward flow of time is just a relativistic concept.

Swami Vivekananda asserts that "if you can know an instant of time", you know all time, as the whole is the rapid succession of one. Master to know

thoroughly one instant - and freedom is reached. Thus, time trek is possible in Indian concept.

Shape of the universe and plurality of the universe

Indian Cosmology favors multiplicity of universe with closed trajectories with curvatures of an egg shape as the very name Brahma - Anda implies. Each Brahmand is regulated by three distinct forces called Brahma Vishnu and Mahesh.

Brahmavaivarta Purana depicts many universes rolling in river Virja. Attendant Shatchandaranana enquires from Lord Vishnu and other Godes to name their universe. This surprises Vishnu. He says that they come from the universe which had once developed crator with the nail of Trivikrani Vaaman.

In Yoga Vashistha queen Leela of Vidurath sees many Brahmandas in Chidikasha. She pierces one of the universes enrolled in vast coverings and makes appearance before the king on the planet earth.

Cycle system of universe

Lord Krishna has declared in Geeta (2-7): At the end of every Kalpa Brahma' s 100 years) all Bhutas enter my Prakrati (the primal cause) and at the beginning of every Kalpa, I bring them fourth again.

The Sankalpa Mantra of Mahanarayana Upanishad which everyday recited at the time of Sandhva also endorses the view:

The sun matter space and lokas as were envisaged in the previous cycle of creation..... says mantra.

Shrimat Bhagwatam declares that the world will ever remain the same : ***Yathedanim tathagre ch paschadpye tadidrshyan.*** (1 0 - 3 - 13)

A question may be asked whether at the beginning of Kalpa, the quieting down is simultaneous over the whole universe or it applies to some systems only? Swami Vivekananda is of the view that it applies to some systems only. The elaborate description of four kinds of' Pralaya or involution along with time span given in Brahrnavaivarta Puranam also support the view; different systems vanish in different pralaya named as Kshudra pralaya, Dainandini pralava. Mahapralaya and Prakrat pralaya. These are equivalent to Kaalratri, Maharatri and Moahratri of Devi Bhagwatam. Vishnu puranam and Maha narayana Upanishasda have also elaborately discussed the phases of involution.

Here it will be noted that Einstein's equations do not provide a final answer to this question of recurrance of universe in cycles. They allow different models of the universe-ever expanding contracting and oscillating according to the geometries applied.

This idea of a periodicity or cycle of expansion and contraction of the universe which involves a scale of time and space was also conceived of by Kurt Godel in 1949 but S. Chandrashekar ruled it out. Later on Fred Hoyle, Tommy Gold and Hermann Bondi while putting forth the steady state universe theory postulated that matter was generated by reprocessing method continuously between the galaxies but the universe had always been the same as it is today. This was the cyclic system of matter. But the induction of matter could not be explained. Later Fred Hoyle put forth-compart-mentalized universe in 1970, which was based on Mach's principal. Fred Hoyle's theory could not stand the problem of star light radiation and the similarities of age of galaxies.

But I am sure that ultimately the theory of cyclic system of universe will also be recognized. Some times the simple fact is overlooked because of its simplicity. The micro is all-cyclic. From the day and night on various planets moving around its suns, from coming out of a tree again from a seed after

withering away is all cyclic. The missing mass is just conversion of the visible. The visible and the invisible both form a composite whole. Truth should therefore, bear the testimony of each other.

The Final Principle

Cosmos in ancient India has been objectively treated to show the infinite nature of the first principle i.e. Brahman. So the analogy applied to Brahman, equally applies to Cosmology studying cosmos also, because Brahmand or cosmos has been treated as one of the seats (Adhisthah) of Brahman.

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