

Cyclic Cosmology and Vedanta

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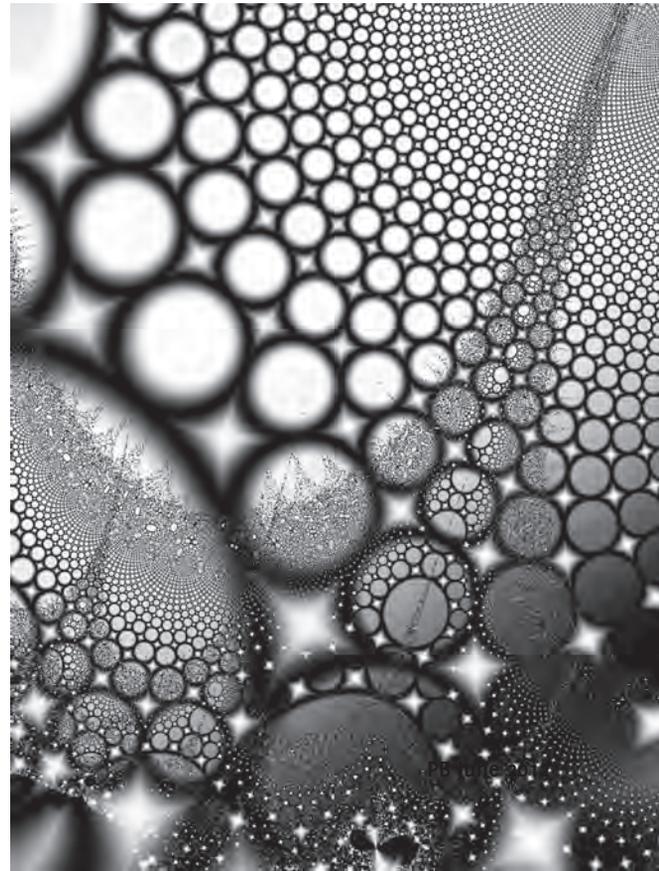
WHERE DO WE COME FROM and how did the universe come into being are questions that have engaged humanity from ancient times. The process of answering these questions has given rise to mythology, legends, stories, beliefs, and science. Much of what humanity thought for thousands of years is now discarded as rudimentary. But some ancient concepts are still relevant and alive because they were spoken from the depths of human experience. Recent cosmological theories are finding significant similarities in the towering philosophy of Vedanta. For instance, several eminent scientists have proposed that the nature of the universe is cyclic, which is a standard belief in Vedanta.

Modern Trend of Vedanta

Advaita Vedanta conceives of Brahman as the ultimate Reality and the world as an appearance. The modern phase of Advaita Vedanta owes much to the great master Sri Ramakrishna and his illustrious disciple Swami Vivekananda, who infused marvellous concepts into the lofty philosophy of Acharya Shankara and facilitated thus a synthesis between Vedanta and modern science. Sri Ramakrishna's concept of *nitya-lila*, the absolute and the relative, modestly restricts the concept of *satya-mithya*, truth and falsity, of Acharya Shankara and infuses a scientific temper into the philosophy of Vedanta. Swamiji says: 'What Ramakrishna Paramahansa and I have added to this [traditional Hindu and Buddhist teachings] is, that the Many and the One are the same Reality, perceived by the same mind at different times and in different attitudes.'¹ Acharya

Shankara taught absolute Consciousness as the only Reality and the world of manifoldness as mere appearance. Swami Vivekananda, accepting the vision of Shankara as cognizable only in the state of transcendence, admits the phenomenal reality and considers it as the *lila* of absolute Consciousness effected through the cosmic principle of *maya*. The masters termed the non-dual aspect of Brahman '*nitya*' and its world-aspect '*lila*'. *Nitya* refers to the ultimate Truth, whereas *lila* to the relative truth viewed with reference to the phenomenal world. *Nitya* is like water and *lila* like water's waves.

Swami Vivekananda wanted to demonstrate that there is a correlation between the Vedantic



concept of unity of existence and the latest discoveries of modern cosmology. In 1895, ten years before Albert Einstein's paper on the special theory of relativity, Swamiji proposed, in a lecture delivered in London, the unity of energy and matter: 'It is possible to demonstrate that what we call matter does not exist at all. It is a certain state of force.' This idea was later captured in Einstein's famous equation $E = mc^2$, in March 1905. In 1895 Swamiji anonymously contributed a paper to the *New York Medical Times* titled 'The Ether',² which drew the attention of Nikola Tesla, a renowned physicist of the time. Besides his significant contribution to the fields of electromagnetism, radar, wireless communications, and radio, Tesla was the first to discover the alternating current. Being charmed by the magnificent thoughts of Vedanta, Tesla ardently attended a few lectures delivered by Swami Vivekananda. He met Swamiji and cherished a desire to mathematically demonstrate the

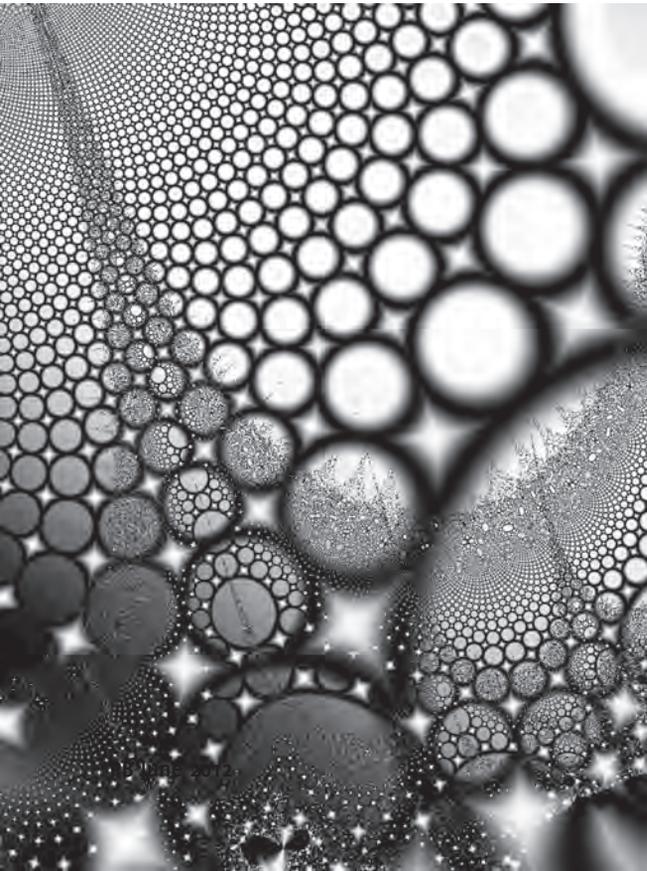
cosmology propounded in Vedanta, but unfortunately the confluence of the two masterminds did not run its full course.³

During those years the Cartesian division of mind and matter and the sovereignty of classical physics, which emphasizes objective investigation, made the subjective approach of Vedanta philosophy not easily acceptable. This was about to change with the uncertainty principle, the epoch-making discovery of Werner Heisenberg in the field of quantum mechanics. It resulted in a surge of subjectivity in physical sciences and dethroned classical physics. In their quest to understand the universe, scientists searching the quantum world were drawing closer to Vedanta philosophy. The Copenhagen interpretation of quantum mechanics,⁴ Bell's theorem,⁵ and Schrodinger's cat paradox impelled materialistic objectivity to die hard. Finally, Godel's theorem⁶ gave a massive final blow to the algorithmic approach to the search for truth. Thus, the speculations of Vedanta, which chiefly advocates the supremacy of subjectivity over objectivity, have become the linchpin in the quest for truth. Thanks to the rise of quantum physics and subjectivity, Vedantic cosmology as expounded by Swamiji has become relevant to the modern perspective.

Vedantic Cosmology

The Vedantic concept of creation is enshrined in the famous 'Nasadiya Sukta' of the Rig Veda,⁷ which is popularly known as the 'Hymn of Creation'. The Sukta is not merely a rare specimen of poetry but is permeated with profound philosophical insight regarding the creation of universe. The first two verses, translated by Swamiji, are:

Existence was not then, nor non-existence,
The world was not,
the sky beyond was neither.
What covered the mist? Of whom was that?
What was in the depths of darkness thick?



Death was not then, nor immortality,
 The night was neither separate from day,
 But motionless did *That* vibrate
 Alone, with Its own glory one—
 Beyond *That* nothing did exist.⁸

In their quest for the ultimate principle of the universe, the Vedic seers arrived at the profound truth that the primal cause of creation is beyond the limitations of name, form, space, and time; it is singular and transcendental in nature. This transcendental Reality has been hinted upon by these words in the Sukta: '*Tad ekam*; That one.' When the universe was undifferentiated, that non-dual Brahman remained united with its inscrutable power, *maya*. In the differentiated state, Vedanta declares, the phenomenal universe was projected into existence by the apparent modification, *vivarta*, of Brahman. *Maya* functions through its two powers of *avarana*, concealment, and *vikshepa*, projection. *Avarana* obscures and conceals the true nature of Brahman, while *vikshepa* creates the universe and all the objects through the process of evolution. *Maya* becomes the substratum of space, time, and causality. Brahman reflected in cosmic *maya* becomes Ishvara endowed with infinite attributes like omniscience, omnipotence, and immanence and is the creator, preserver, and destroyer of the universe. While interpreting the Sukta, Sayanacharya, the great Vedic commentator, teaches that Ishvara is the efficient as well as the material cause of the universe.

Brahman without qualities, *nirguna*, becomes Brahman with qualities, *saguna*, due to *maya*. The two aspects are also spoken of as transcendent Brahman and immanent Brahman. The first manifestation of Saguna Brahman is Ishvara. Some of the names of Saguna Brahman are Hiranyagarbha, Virat, Sutratman, and Prana. All these names denote the Cosmic Self, the Cosmic Mind, or the Cosmic Person. According to most Vedantists, Brahman conditioned by the

causal universe is called Ishvara, conditioned by the subtle universe is called Hiranyagarbha, and conditioned by the gross universe is called Virat.

Vedanta upholds the unceasing cyclic nature of cosmic evolution. The universe is not absolutely created or annihilated, it undergoes sequential transformation from the non-manifest to the manifest state through phases of periodic expansions and contractions, eternally. Swamiji explains:

Our Sanskrit word for creation, properly translated, should be *projection* and not *creation*. For the word creation in the English language has unhappily got that fearful, that most crude idea of something coming out of nothing, creation out of non-entity, non-existence becoming existence, which, of course, I would not insult you by asking you to believe. Our word, therefore, is projection. The whole of this nature exists, it becomes finer, subsides; and then after a period of rest, as it were, the whole thing is again projected forward, and the same combination, the same evolution, the same manifestations appear and remain playing, as it were, for a certain time, only again to break into pieces, to become finer and finer, until the whole thing subsides, and again comes out. Thus it goes on backwards and forwards with a wave-like motion throughout eternity. Time, space, and causation are all within this nature. To say, therefore, that it had a beginning is utter nonsense. No question can occur as to its beginning or its end. Therefore wherever in our scriptures the words beginning and the end are used, you must remember that it means the beginning and end of one particular cycle; no more than that (3.123).

At the end of a cycle of the universe everything becomes finer and finer and is resolved back into the primal undifferentiated state from where it emerged. This state has been described in the Sukta as *anidvatam*, 'it vibrated without vibration'.

At the commencement of a new cycle, under the cosmic spell of *maya*, the first element to appear in the potential universe is *akasha*, space. Space is acted upon by *prana*, force, vibration, and as the vibrations become faster, space commences to inflate and create all the world systems. *Akasha* is the one universal material from which everything has emerged, and *prana* is the one universal force. All forces found in the universe—call them electromagnetism, weak and strong nuclear forces, gravitation, heat, light, emotion, thought, attraction, repulsion—are vibrations, are *prana*. The universe is characterized by vibrations, and as long as vibrations continue, various names and forms emerge and merge, to again be recycled with new names and forms. Today science tells us that nothing is static in the universe, and that even ordinary space is dynamic.

Cyclic Universe

In the 1920s Edwin Hubble peered into his telescope atop Mount Wilson and changed the way we looked at the universe. He found billions of galaxies, thought of as stars, rushing away from each other. The universe is expanding. And from this observation came the theory of the Big Bang, which states that the material universe had its origin in a small and infinitely dense singularity that exploded, so to say. Matter flew in all directions, cooled, and clumped together through gravity. The discovery of the cosmic microwave background radiation validated the Big Bang theory, as it was found that this radiation was the leftover heat of the Big Bang. The Big Bang became scientific dogma.

Everything seemed perfect until other cosmological theorists brought a dazzling array of explanations that blew up the cosmological peace. The way matter is distributed all over the universe seems to be more the consequence of a smooth inflation than the after-effects of a

violent bang. Gravity, under certain conditions, may repel to produce a gigantic uniform expansion. Some theorists then proposed that the universe might not end in a big crunch, but it will reverse to a point of infinitely dense matter, whose own dense gravity will make it expand again. Whether the universe starts with a bang or by inflation, both theories imply that the universe is finite, which leads to the possibility of many universes, many Big Bangs. Cosmologists who applied quantum theories of non-locality and entanglement to cosmology came up with even more radical models. Today we can speak of an anti-universe, an alternate universe, or parallel universes, to the astonishment of many.

The model proposed by Paul J Steinhardt and Neil Turok as the alternative to the Standard Big Bang model is capable of explaining the whole host of physical observations in detail. According to their cyclic model, the evolution of the universe is cyclic in time, and the universe undergoes infinite cycles of expansion and contraction, in which the density and temperature remain finite.⁹ Being influenced by the string theory, the model successfully addresses the many loopholes of the Big Bang theory, which has long dominated the scientific world. As the *ex nihilo* creation proposed by the Big Bang model became untenable, the advocates of the cyclic universe propounded that space and time are infinite. An earlier theory of periodic universes underwent a massive setback when the second law of thermodynamics, called entropy, was put forward. Richard C Tolman, interested in applying thermodynamic principles to relativistic systems, pointed out that the total entropy of the universe goes on rising from one cycle to the next. He also found that as the entropy of the universe rises, the cycles grow bigger and bigger, as a result of which the universe ceases to be strictly cyclic. Again, despite a continued rise in entropy, the universe never reaches a thermodynamic

equilibrium, which is awfully strange.¹⁰ The cyclic model of Steinhardt and Turok properly addresses the conundrum, setting the theory free from discrepancies.¹¹ This model suggests that the entropy density has a perfect cyclic behaviour, with entropy density being created at each bang. The entropy density grows to attain a certain value and then decreases to a negligible level before the next bang. The paradigm of cosmology put forward by Steinhardt and Turok follows the Ekpyrotic scenario proposed by Justin Khoury, Burt Ovrut, and Nathan Seiberg, who stated that space and time being infinite, the universe undergoes sequential expansions and contractions, and the bang marks the transition from the contraction to the expansion phase.¹²

The cyclic theory propounds that the bang is followed by the direct entry into the radiation-dominated period. Then, as the universe enters the dark-energy-dominated region, the cosmic acceleration commences. Basically, the entire cyclic energy scenario is governed by the field of dark energy. Scientists suggest that the field of dark energy generates a phase of slow acceleration, converts acceleration into retardation, and subsequently contraction and reheating begin. Finally, the dark energy makes the universe end its contraction phase to start expansion again, triggering off another new cycle.

Swamiji reiterated that the universe undergoes a series of *vikasa*, expansion, and *sankocha*, contraction, in the course of its evolution. He says: ‘There is another common ground of belief [among various philosophies in India]: that of creation in cycles, that the whole of creation appears and disappears; that it is projected and becomes grosser and grosser, and at the end of an incalculable period of time it becomes finer and finer, when it dissolves and subsides, and then comes a period of rest. Again it begins to appear and goes through the same process.’¹³

Vedanta conceives of the universe to be eternal as Ishvara, who is the *sakshi*, witness, and the controller. Being the cause of the universe Ishvara is infinite, and its effect, the universe, is also infinite. ‘At one time, when Swamiji sat for meditation, there appeared before him a very large, wonderful triangle of light which, he felt, was living. One day he came to Dakshineswar and told the Master this, when the latter said, “Very good; you have seen the Brahmayoni; while practising Sadhana under the Vilva tree, I also saw it; what was more, I observed it giving birth to innumerable worlds every moment.”’¹⁴ *Brahmayoni* is the womb of Brahman. The Bhagavadgita teaches: ‘My womb is the great-sustainer. In that I place the seed. From that, O scion of the Bharata dynasty [Arjuna], occurs the birth of all things.’¹⁵

Vedanta considers that the universe is the manifestation of consciousness under the operation of *maya*. In Vedantic parlance the Big Bang can be said to be a ‘bang of consciousness’. The *Aitareya Upanishad* declares: ‘All these are impelled by Consciousness; all these have Consciousness as the giver of their reality; the universe has Consciousness as its eye and Consciousness is its end. Consciousness is Brahman.’¹⁶ Further, in the *Taittiriya Upanishad* a seer exclaims: ‘That (Brahman) having created entered into that very thing. And having entered there, It became the formed and the formless, the defined and the undefined, the sustaining and the non-sustaining, the sentient and the insentient, the true and the untrue. Truth became all this that there is. They call that (Brahman) Truth.’¹⁷

The bang is, therefore, not creation out of nothing as proposed by the Big Bang theory, but it is the event through which the unmanifest universe becomes manifest—of course, the manifestation is of Consciousness. Echoing Vedanta philosophy, proponents of the cyclic model discard the concept of the origin of the universe

out of nothing and reiterate that the bang marks the transition from the contraction of the universe to its expansion. The cyclic theory suggests that tiny density variations, called ripples of the previous cycle, govern the growth and decay of the next cycle. *Akasha* and *prana* apparently correspond to all the universe's matter and energy respectively. *Prana*, being the substratum of all energy, produces a force-field that controls the evolution of the universe. This force-field, Ishvara's consciousness, intelligently administers the universe in all its stages. In his book *The Intelligent Universe*, the great astrophysicist Fred Hoyle admits that an intelligent principle has begotten the universe.¹⁸ Many modern scientists informally acknowledge that consciousness is a more fundamental substance or entity than any inanimate cause conceived till now. The Vedas declare: 'Afterwards the Ruler of sentient and non-sentient beings—who made day and night—ordained sun and moon, sky and earth, and atmosphere and blissful heaven, just as they were in the previous cycles of creation.'¹⁹

In the context of this article the hiatus between Vedanta and science also needs to be brought into focus. The period of the cycles proposed in Vedanta does not correspond to the predictions of modern science. On the other hand, the scientific theory of a cyclic universe has been developed without making any reference to consciousness, which Vedanta considers fundamental. 

References

1. *The Complete Works of Swami Vivekananda*, 9 vols (Calcutta: Advaita Ashrama, 1-8, 1989; 9, 1997), 8.261.
2. *Complete Works*, 9.285.
3. See Swami Tathagatananda, 'Swami Vivekananda's Search for a Mathematical Demonstration of the Unity of Existence', *Bulletin of the Ramakrishna Mission Institute of Culture*, 61/1 (January 2010), 11-14.
4. It is a rejection of the presumption that nature could be understood in terms of elementary space-time realities.
5. The theorem states that any hidden variable that satisfies the condition of locality cannot possibly reproduce all the statistical predictions of quantum mechanics, and places upper limits for the predictions of any such theory on the strength of correlations between measurements of spatially separated objects, whereas quantum mechanics predicts very strong correlations between such measurements. See <<http://www.answers.com/topic/bell-s-theorem#ixzz1qgdwVauL>> accessed 26 March 2012.
6. Any such precise 'formal' mathematical system of axioms and rules of procedure, provided that it is broad enough to contain descriptions of simple arithmetical propositions and that it is free from contradiction, must contain some statements that are neither provable nor disprovable by the means allowed within the system. The truth of such statements is thus 'undecidable' by the approved procedures. See 'Metalogic' in *Encyclopaedia Britannica* (Chicago: Encyclopaedia Britannica, 2009).
7. Rig Veda, 10.129.1-7.
8. *Complete Works*, 6.178.
9. Paul J Steinhardt and Neil Turok, 'The Cyclic Universe: An Informal Introduction', <<http://arxiv.org/abs/astro-ph/0204479>> accessed 26 March 2012.
10. See Paul Davies, *The Mind of God* (London: Penguin Books, 2008), 52.
11. Lauris Baum and Paul H F, 'Turnaround in Cyclic Cosmology', <<http://link.aps.org/doi/10.1103/PhysRevLett.98.071301>> accessed 26 March 2012.
12. 'The Cyclic universe: An Informal Introduction'.
13. *Complete Works*, 2.239.
14. Swami Saradananda, *Sri Ramakrishna the Great Master*, trans. Swami Jagadananda (Chennai: Ramakrishna Math, 2010), 279.
15. Bhagavadgita, 14.3.
16. *Aitareya Upanishad*, 3.1.3.
17. *Taittiriya Upanishad*, 2.6.1.
18. See Swami Ranganathananda, *The Message of Brihadaranyaka Upanishad* (Kolkata: Advaita Ashrama, 2005), 426.
19. *Mahanarayana Upanishad*, 1.65.