Quantum Computation and Consciousness in Cyclic and Mythological Models of Universe

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Summary

Cyclic models such as Steinhardt-Turok model, Baum-Frampton model, and CCC models have been proposed for the universe. It has been postulated that the value of the physical constants in different aeons may possibly be different. We argue that this may lead to different patterns of quantum computation and hence consciousness in different aeons and we draw parallels with the mythological models.

Introduction

In the 1920s, noted theoretical physicists, such as Albert Einstein, considered the possibility of a cyclic model for the universe as opposed to the model of an expanding universe. However, Richard C. Tolman in 1934 pointed out that these attempts failed because according to the Second Law of Thermodynamics, entropy can only increase (Tolman, 1934). The situation changed in the early 21st century when the newly discovered dark energy component pointed to a probable consistent cyclic cosmology (Frampton, 2006) Experimentally in 2011, a five-year survey spanning 7 billion years of cosmic time and 200,000 galaxies suggested to many scientists that "dark energy" is responsible for our expanding universe"

The Steinhardt–Turok model

It was proposed in 2001 by Paul Steinhardt and Neil Turok . The theory describes a universe exploding into existence repeatedly over time (Steinhart and Turok, 2001a, Steinhart and Turok, 2001b). In this model, two parallel M-branes periodically collide in a higher dimensional space.(Steinhart and Turok, 2004). A, brane, membrane or *p*-brane is a spatially extended mathematical concept that appears in many theories for example M-theory, brane cosmology and string theory. The membrane exists in a fixed number of dimensions. In the Steinhardt-Turok model one of these branes houses the visible four dimensional universe. The collisions correspond to a reversal from a big crunch followed immediately by a big bang or contraction to expansion. The matter and radiation in the current era are hypothesized to be generated during the most recent collision in a pattern governed by quantum fluctuations created before the branes. Finally, the universe reached the currently observed state before beginning to contract again sometime in the future. Dark energy is hypothesized to correspond to a force between the branes, and solves the flatness, horizon and monopole problems. According to this model the cycles can continue indefinitely into the future and the past.

This model evades the problem of thermodynamic heat death envisaged by Richard C. Tolman (Tolman, 1934) by having a net expansion in each cycle thus preventing entropy from piling up. However, there are certain problems with the model. Firstly string theorists do not understand colliding branes comprehensively. In addition as in cosmic inflation, though the general character of the forces required to create the vacuum fluctuations is known, the particle physics is unable to explain it completely (Woit, 2006)

The Baum–Frampton model

A cyclic model was proposed in 2007 by Lauris Baum and Paul Frampton of the University of North Carolina at Chapel Hill (Baum and Frampton, 2007). This model makes a technical assumption concerning the equation of state of the dark energy which relates pressure and density with a parameter **w** (Baum and Frampton, 2007a,b). It assumes a condition called phantom energy throughout a cycle, including at present. (In contrast, Steinhardt–Turok model does not assume this). In the Baum–Frampton model, a septillionth (or less) of a second before the would-be Big Rip, a turnaround occurs and only one causal patch is retained as our universe. This generic patch contains no lepton, quark or force carrier; only dark energy – and therefore its entropy vanishes. This model avoids many difficulties confronting matter in a contracting phase such as going through phase transitions like of QCD and electroweak symmetry restoration and excessive structure formation, proliferation and expansion of black holes.

Conformal Cyclic Cosmology (**CCC**)

The CCC is a cosmological mode proposed by theoretical physicist Sir Roger Penrose in the broad framework of general relativity, In CCC, the universe undergoes infinite cycles, with the future time like infinity of each previous cycle being identified with the Big Bang singularity of the next. Penrose outlines this theory in his 2010 book *Cycles of Time: An Extraordinary New View of the Universe*.

The cosmological constant (usually denoted by Λ) is equivalent to an energy density in empty space. It was originally proposed by Einstein as a modification of his original theory of general relativity to achieve a stationary universe. The predictions of equations of Einstein's general theory of relativity are in consonance with the observations on time-dependence of the actual expansion of the universe; however, this prediction is true only if cosmological constant is incorporated into the theory. Einstein abandoned the concept of cosmological constant after the observation of the Hubble redshift which indicated that the universe might not be. The current standard model of cosmology, however, includes this term as a number of observations which includes the discovery of cosmic acceleration in 1998 have revived the cosmological constant, though, cosmological constant is not completely accepted by all experts in the field .In passing from one aeon (corresponding to yugas in the Hindu mythology: refer to the section on Hindu myhtology) to the next, according to conformal cyclic cosmology(as described in the previous section) there might be changes in the value of N

The Λ's value can be specifically related to the gravitational constant G, the speed of light c and Planck's constant h by the formula given below, with the 6^{th} power of a certain large number N in the denominator.

$$\Lambda \approx \frac{c^2}{N^2 Gh}$$

$$\hbar = \frac{h}{2\Pi}$$

The number N is about $10^{20.}$ In 1937 Paul Dirac pointed that various integer powers of this number seem to appear (approximately) in several different ratios of the basic physical dimensionless constants, especially when gravity is involved. (For instance the ratio of the electric to the gravitational force between the electron and the proton in a hydrogen atom is around $10^{40}=N^2$). Dirac also noted that the age of the universe is about N^3, in terms of the absolute unit of time $t_{p,}$ that is referred to as the Planck time. The Planck time, and the corresponding Planck length $l_p=ct_p$, are often regarded as providing a quantum of time and space (or kind of minimum space time measure respectively).

By the use of these 'Planck units' and also the Planck mass m_p and Planck energy E_p given by

$$t_P = \sqrt{\frac{Gh}{c^5}} \approx 5.4x10^{-44}\, s, \quad l_p = \sqrt{\frac{Gh}{c^3}} \approx 1.6x10^{-35}\, m.$$

$$m_p = \sqrt{\frac{hc}{G}} \approx 2.1x10^{-5}\, g, \; E_P = \sqrt{\frac{hc^5}{G}} \approx 2.0x10^{9}\, J,$$

which are naturally determined units, many other basic constants of Nature can be expressed as pure (dimensionless) numbers. In particular, in these units we have Λ approximately equals N^{-6}. Dirac thought that as the age of the universe is increasing with time, then N should be increasing with time or, G reducing with time, (in proportion to the reciprocal of square of the age of universe). However, more accurate measurements of G since the time Dirac put forth his ideas have shown that G (or N) if it is not constant, cannot vary at the rate that Dirac's ideas required.

The powers of N apparently determine the various ratios between dimensionless physical constants which vary widely. It was first suggested by John A. Wheeler that basic constituents of nature may differ from one aeon to the next. Thus N in our aeon, which takes the value of approximately 10^{20} might have different values in other aeons.

Mythology

The smallest cycle in Hindu mythology is called a maha yuga. A maha yuga is 4,320,000 human years (however there are many scholars who interpret it differently). Each maha yuga is subdivided into the Satya yuga, Treta Yuga, Dvapra Yuga, and kali Yuga, whose lengths are in the ratio of 4:3:2:1: (Table 1)

Age	Duration	Characteristics	Human stature	Lifespan	Death
Satya Yuga/Krita Yuga/Golden Age/Age of Truth	1,728,000 human years	virtue reigns supreme	21 cubits	lakh of years	death occurs only when willed.
Treta Yuga / Silver Age	is 1,296,000 human years	the climate is three quarters virtue and one quarter sin	14 cubits	10,000 years.	
Dvapara Yuga/ Bronze Age	864,000 human years	the climate is one half virtue and one half sin		1,000 years	
Kali Yuga/ Iron Age	432,000 human years	the climate is one quarter virtue and three quarters sin	3.5 cubits	100 or 120 years	

As pointed out earlier it is possible that N in one aeon may differ from one another. Thus we propose that the value of N in the ages mentioned above may be different. Since the value of N may be different it may lead to difference in physical constants of the different ages in the universe. This may lead to different patterns of quantum computation (Universe has been thought of as a huge quantum computer, Lloyd, 2006) and going by theory proposed by Penrose and Hameroff (Hameroff and Penrose, 1996) the consciousness in the universe (which can be defined by consciousness vector, Grover 2011) will be different in these ages. This will be reflected in the various parameters of the universe in different ages as mentioned above. The cyclical nature of the yugas mentioned above is in consonance with the cyclical models of the universe presented in the previous section.

References

[1] Tolman, R.C. (1934). *Relativity, Thermodynamics, and Cosmology*. New York, Dover.
[2] Frampton, ,P.H. (2006) "On Cyclic Universes". arXiv:astro-ph/0612243
[3] Steinhardt, P.J. , Turok, N. (2001a). "Cosmic Evolution in a Cyclic Universe". *Phys.Rev.D* 65 (12):126003
[4] Steinhardt, P.J. , Turok, N. (2001b). "A Cyclic Model of the Universe". *Science* 296 (5572): 1436–1439.
[5] Steinhardt, P.J., Turok, N. (2004). "The Cyclic Model Simplified". *New Astron.Rev.* 49 (2–6): 43–57
[6] Woit, P. (2006) *Not Even Wrong*. London: Random House.
[7] Baum,L., Frampton, P.H. (2007a). "Entropy of Contracting Universe in Cyclic Cosmology". *Mod.Phys.Lett.A* 23: 33
[8] Baum, L., Frampton P.H. (2007b). "Turnaround in Cyclic Cosmology". *Physical Review Letters* 98 (7): 071301
[9] Lloyd, S. (2006) Programming the universe, Vintage Books, New York.
[10] Hameroff, S.R. and Penrose, R. (1996) In: Toward a Science of PConsciousness The First Tuscon Discussions and Debates. Hameroff, S., Kaszniak, R. And Scott, A.C. (eds):507-540 MIT Press
[11] Grover, M. (2011) The Quantum Computing Conscious Universe and The Extended Deep Ecology Hypothesis: Implications for Medicine, Agriculture and Technology, Int. J. Engg. Sci Tech., 813-815