

“Philosophising consciousness from string theory”

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Abstract

The notion of consciousness has been studied in many ways out of which, there could be a scientific approach of studying it using string theory which enjoys the mathematical coherence. The paper aims to study consciousness using string theory in which the role of graviton will be discussed. The notion of parallel universes given by string theory would be tackled to understand consciousness and make an attempt to clarify the notion of other world or universe and parallel universes, the problems of time travel, soul and death in the universe or universes of strings which gets twisted and compactified.

Introduction

The journey to understand “Consciousness” philosophically has been since historic times in the discourse of human intellect. An attempt has been made to study it in an empirical way since the Greek philosophers Alcmaeon (c. 500BC) and Hippocrates (c. 460BC) - the founders of empirical neuroscience¹ who were working on the role of brain in solving philosophical problems, emotional and cognitive processes². Then, Plato came with the concept of an immortal soul immersed in a mortal body³ creating a breeding ground for mind-body problem which became more distinct by Descartes’ *res extensa vs res cogitans* in which he argued for the uniqueness of *res cogitans* which led to consciousness⁴. The notion of dualism born out of mind-body problem was weakly argued by Aristotle and Thomas Aquinas but strongly supported by Karl Popper and neurophysiologist John Eccles⁵.

To study consciousness, there could be two major ways of modern scientific approach. The first approach is an attempt to understand that the consciousness is based in the brain and for this, neurobiological approach is engaged. It discusses the local model of consciousness. The second approach deals to understand that the brain is based in the consciousness by engaging with quantum physics. It brings the concept of non-local model of consciousness.

The first approach is not of a focus in this paper. The second approach needs to be given some background before going to string theory to make an attempt to understand consciousness. The second scientific approach gets motivated by quantum physics to understand the non-local model of consciousness to reflect on the notion that the brain is based in the consciousness. The need for such discussion is to understand the continuity of consciousness since quantum physics which deals with

Non-locality from Bell's Theorem brings the concept of non-local interconnectedness⁶. The analogy of brain with a television and world wide communication is used to understand the non-local model of consciousness. The biological nonlocality and the mind-brain interaction problem⁷ helps in understanding consciousness by solving mind-brain problem through biological entanglement and nonlocality using quantum mechanics.

"I am become death, the destroyer of worlds.", said by J. Robert Oppenheimer, director of the laboratory that developed the first atomic bomb, when he saw the fireball glowing over the New Mexico desert at the Trinity test site on 16th July 1945 and those words which came to his mind were derived from the Bhagavad-Gita.⁸ Erwin Schrodinger whose equation is fundamental in quantum mechanics has read Indian philosophy while studying in University of Vienna. Later, he was influenced by Upanishads in his understanding of scientific world.⁹ The mentioned examples are to relate with philosophy and science and physics in particular. The notion of string theory on its lack of empiricism and thereby, many particle physicists or scientists claim for its invalidity unlike other normal sciences whose laws are experimentable in laboratories, often makes them to confer the status of string theory being '*philosophical*' rather than being appreciated as a scientific discourse in modern scientific world. The puzzling between empiricism and realism of the string theory to understand the mystery of nature in a human comprehensible manner leads to a debate of not whether to either accept or reject the proposed theory but whether to give an *epistemological* status of the theory whose consistency is backed by an internal mathematical coherence for more than thirty years or to empirically allow itself to vanish after obtaining an inconsistent result from the future laboratory experiment. Like Maxwell's theory of electrodynamics rightly predicted the existence of radio waves but unlike Ernst Mach who in 19th century said that invisible atoms were unscientific and now, no one would ever listen to him (E. Mach), so, as long as string theory remains untestable to be proven wrong, there may not be a necessary necessity but sufficient necessity to philosophise string theory under the domain of philosophy of physics alongside with the advancement of it from the view of a theoretical string physicist in contrast to a particle physicist who claims that strings are absolutely for crackpots.

Why string theory to unlock the mystery of universe or universes ?

The larger question is, where will string theory be discussed, if not in philosophy at least when physics world has orphaned it and even if not, but rejected it even to be an orphan of physics?

Historically, Albert Einstein's general theory of relativity to understand gravity couldn't be unified with the quantum field theory which had already unified the three forces of interactions namely, weak, strong and electromagnetic interactions. Even, Einstein's special theory of relativity was unified with quantum field theory to form QED (Quantum Electro Dynamics). The notion of unification of fundamental physical laws governing nature is essential in order to know 'our' universe and is not only limited to grand unification to form "Theory of Everything" but also, to expound the philosophical treatment for nomological unification.¹⁰ The breaking down of both Einstein's general relativity and quantum field theory while explaining black hole, a region of space-time in which light gets trapped, as the black hole is

a unique real example in which its size is so infinitesimally small due to which, quantum law has to be applied while its mass is so massive to infinity due to which, gravity law has to be applied and both the antagonistic laws break down in the black hole, and to solve this quantum gravity problem, a rescue team has come in the form of “String Theory” initially, but latter, it has 5 versions of string theories which are now clubbed under M (Master or ?¹¹) - theory. This scientific complexity in physics was so strong to the point that Einstein in his life never accepted quantum mechanics and went on with his general relativity to explain the space-time curve of gravity in contrast with Newton’s law of gravitation in classical physics, thereby leading to the theoretical prediction of bending of light. String theory, assumed to be the grand unified master theory at present, was given a base in mathematical formulation by Gabriela Veneziano after accidentally stepping on 200 years old Euler’s beta function formula and subsequently, it was given a treatment of assigning “vibrating string” by Leonard Susskind to explain the phenomenon which had been mathematically discussed only, for decades without physical consequentialism.¹²

What is String theory ?

A string theory is the youngest theoretical theory in physics to explain the mysteries of universe or parallel universes as the theory suggests and it is based on the fundamentals and principles of a “string” as the most basic fundamental building block of the universe instead of referring to either particle or wave or dual nature of matter which is both particle and wave in the existing world of physics.

A string has one-dimensional vibration which comes primarily into two types, i.e. open strings and closed strings like loop. Universe, in string theory is considered to be made of strings and extensible string in the form of brane - the surface on which the open strings having two end points get attached and thus, can’t leave the universe. Open strings are photons and non gravitational interactions. While, closed strings in the form of loop are gravitons and carriers of gravitational interactions and closed strings are free strings, as they are not attached to the brane (the term ‘brane’¹³ broadly means a physical object which comes in the fields of gravity and string and it has to do with a dimensional spatial extent) and ,namely D(Dirichlet)-brane obeying Dirichlet boundary conditions while strings with free end points obey Neumann boundary conditions. String theory requires 11 dimensions to understand universe. Out of 11 dimensions, string theories need 10 dimensions, the extra dimension is additionally required in M-theory. Leaving space-time (x,y,z,t) 4 dimensions that humans encounter everyday, the remaining 7 dimensions are compactified in topological (non breakable but twistable) shapes and dynamics of strings as strings don’t need size but shapes and dynamics to compare under mirror symmetry using ‘Calabi-Yau ’ manifold. It believes that our universe is like a large flat surface with an insignificant thickness called membrane or ‘brane’ floating around in hyperspace in which, many parallel universes are also present, closed to our own universe.

“String theory will be needed to study cosmology of the Very Early Universe. String theory may provide a concrete model for the realization of inflation – a period of dramatic exponential expansion that the universe is likely to have experienced at the earliest times....String theory is in fact an unfinished theory....”¹⁴

Philosophising string consciousness

Before discussing string consciousness, something unique could be learnt from philosophy of plasma physics and cellular biology.

Bacteria may be no larger than 10 microns, viruses no larger than 100 nanometers, molecules about 1 nanometer and atoms about 0.1 nanometer. Does scale impose a barrier to life or even consciousness? If viruses are considered life forms (as some leading astrobiologists argue) then they constitute "nano-life".

Consciousness may even exist at the quantum scale. "In some strange way, an electron or a photon [or any other elementary particle] seems to 'know' about changes in the environment and appears to respond accordingly," says physicist Danah Zohar. A group at the Weizmann Institute in Israel has done a variation of the famous "double-slit" experiment. They used electrons, instead of photons, and observed how the resultant interference pattern (which indicates wave-like properties of the particle) dissipated the longer you watched the electrons go through the slits. As a wave, the electron passes through both slits simultaneously but if, according to E Buks, it "senses" that it is being watched, the electron (as a particle) goes through only one path, diminishing the interference pattern. Elementary particles (such as photons and electrons) appear to possess a certain degree of "intelligence" and awareness of the environment. Renowned plasma and particle physicist, David Bohm, says "In some sense a rudimentary mind-like quality is present even at the level of particle physics. In a new field called "quantum metaphysics", Jay Alfred has proposed that consciousness is as fundamental a property to elementary particles as properties that make it "matter" or a "physical force" (for example, mass, spin and charge).¹⁵

In the book *"The Conscious Universe"*, astrophysicist Menas Kafasto and philosopher Robert Nadeau interpret that the wave function as ultimate reality itself.¹⁶

Following the reading of some existing work mentioned above, it could be argued that, why 'mind like quality' which is present at the level of elementary particles like electrons according to a particle physicist, and, as astrobiologists too argued against scale of measurement to define consciousness in life forms and also, the very fact that quantum physicists' inclination of being supportive when confronted with the notion of consciousness being caged even by quantum scale, 'should' rather than 'would' give a double standard and parochial intellectual attitude if (in case, if string consciousness withstanding that strings are empirically validated to be true or till they become to be tested as truth) string consciousness is given a step motherly treatment on the clouded question of 'pseudo science', then those who call 'pseudo science' but can't claim an iota of being non-mathematical, would either have to rethink their status of quantum consciousness or left with no choice but to respect string consciousness and besides this, why should a scale of restriction be stopped at quantum scale only or whether it would go further smaller even to a level of Planck length, the smallest length possible in physics, as yet and why shouldn't it go further as nature would have no such restriction of only favouring quantum scale and not string scale like Planck length, and why should nature be biased?

There could also be a further argument that, the question -why some strings get attached to the D-brane and why some are free to flow to other universes and why they behave in that manner, has a calibre to ignite the notion of string consciousness, as whether, some strings love to be with a particular universe like a country based 'bureaucrat' and some love to be like an all time moving 'diplomat' interacting with other universe, or why can't a string change on its own from closed to open and vice versa if it is expected to be conscious, besides attacking the problem using mathematical boundary conditions.

The motivation to use string theory to study consciousness comes from the problem of relativistic quantum gravity. I find significantly interesting to use the methodology of light cone physics to try making an attempt to study consciousness. "In light cone physics, the quantization of a relativistic string can be worked out most directly using light-cone coordinates. There is a different approach to the quantization of the relativistic string, in which no special coordinates are used. This approach is called Lorentz covariant quantization. The curves that remain within the light-cone and whose slopes never go below 45° are possible world-lines of physical particles."¹⁷ The light cone could be used to understand past, present and future time.

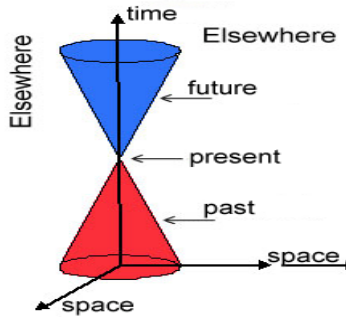


Fig. Light cone showing past, present and future.

Ontologising probable information exchanges using gravitons among universes

Understanding the probable information exchanges among the parallel universes would involve the role of gravitons. Graviton is a theoretical particle having no mass and no charge and it mediates (carries) the gravitational force. It is a boson. Its existence has not yet been confirmed experimentally, although string theory predicts its existence as closed strings with minimum possible energy. It is also theorized that gravitons interact with leptons and quarks.¹⁸

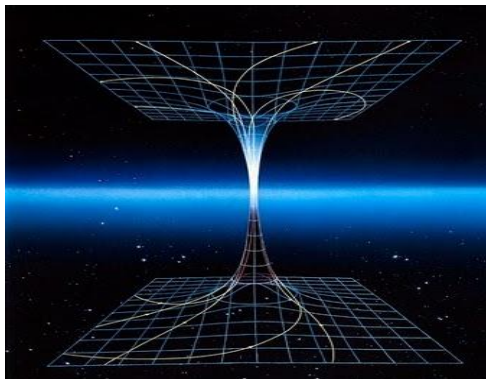


Fig. Schematic presentation of probable Parallel Universes

Dr. Jorgen Magner¹⁹ and physicist Brian Greene²⁰ talk about the probable parallel universes and gravitons which are the closed strings, can leave our universe as they are not tight to D-brane, thus, they can go out to other universes and come back too, thereby, making possibly a high chance to get some information from the other universe when gravitons come back to our universe. The fact that our human eyes can't detect outside alien information is because, human eyes can see only photons when strike on retina of an eye and since, photons are strings which are non-gravitational and hence, attached to D-branes, thus, they can't leave our universe and hence, can't be the source of information exchange between our universe and external or neighbouring universe. A few physicists who love string theory talk about location change in a short span of time by changing the mode and shape of the strings but for that, other compactified dimensions are to be used. They also discuss about human mind which has no limit in expanding wild imagination which might also have been influenced by the *in* and *out* flow of gravitons from human mind, not only within our universe but also from outside, thus, *humans are also not an absolute non-transcendentalist*.

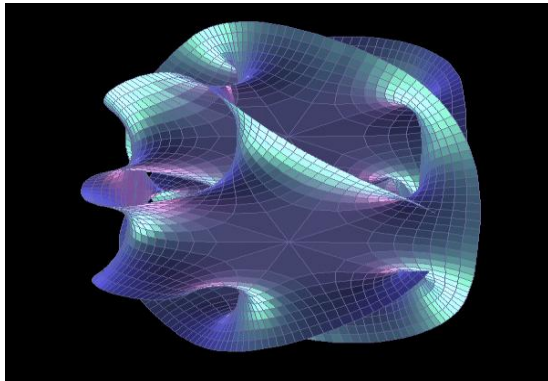


Fig. Calabi-Yau compactified string

Reflecting on the '*in* and *out* flow' of gravitons, an observation could be made that, parallel universes and exchange or flow of free gravitons, could be used to discuss the ontological status of other live forms or other beings in other universes which may be shaped in the form of twisted Calabi-Yau compactified string which is so complex to view from one point to another point of reference and also, the question of NDE (near death end) experiences, metaphysical questions like notion of 'after-death happenings' and soul, meeting with people who are dead from human world, perhaps could be discussed understandably with scientific conviction which has a mathematical consistency in a near future.

In my analysis, there could also be a problem in consciousness in time travel from future to past as in the case of time travel, the condition which is given by $[\Delta t \neq 0, t(\text{future}) \neq t(\text{past})]$ needs to be accepted by time, which means that time (t) of the future $[t(\text{future})]$ is not to be equal to time of the past $[t(\text{past})]$. And in accepting so, which means that there should be a change of time and it can't be zero $[\Delta t \neq 0, \Delta t = \text{change in time}]$ as the initial and final time are different, the problem is about space (s) which is constrained by its condition which is given by $[\Delta s \neq 0, s(\text{future}) \neq s(\text{past})]$ i.e. there should be a change in space meaning different space $[\Delta s \neq 0, \Delta s = \text{change in space}]$ making a difference between the future space and past space which is given by the space condition $[s(\text{future}) \neq s(\text{past})]$.

Another observation could be, though, God is still not yet traced by string theory but, nevertheless, as Einstein said, "God doesn't play a dice.", I 'firmly' believe that, unlocking the mystery of our universe by

using string theory or,whether coming nearer to Einstein's dream of "Theory of Everthing" through grand unification theory,are all leading to try finding the nearer thought ,perhaps probably thought by the Ultimate Creator whose domain of search would become more bigger with string theory explaining parallel universes. The fact that,string theory which is non testable can't be the sole criterion for attacking it as non-scientific but rather,experimental particle physicists in Fermi Lab and CERN should work on capturing gravitons in their own laboratories to further prove whether strings could hold empiricism and respect its realism.The 'probable' failure of string theory in future might be from its perturbation (approximation) theory and also because of the fact that,there is no principle or law fundamental (might be the strings would give the grand fundamental law in itself) in nature,on which,M-theory could be applied despite having so many examples of solutions of string theory due to many dimensions,but having said this,its not an easy big claim to outrightly reject more than a few decades old theory which has a mathematical coherence without any doubt of inconsistency in approach,so,it would be little more unwise for any rational human being to call string theoretical physicists as crackpots.

The intellectual necessity and philosophical urge to discover the hidden truth of human's ever existing mystery of unlocking the strangeness of universe and its possible neighbour(s) or the metaphysical questions of the ultimate creator of Universe whether it is to be some God or gods or some energy or aliens or strings or particles could not be considered to have failed in getting it approved ,if approved from the understanding of the notion of philosophizing strings and trying to understand the probable information exchanges among the parallel universes using a type of string called graviton which is considered to be closed strings by the string theorists and also called bosons by the particle physicists and this puzzle of where graviton could actually lie whether in string theory or particle physics could not be considered as an impossible point of mathematico-scientific debate.

Conclusion

The study of consciousness in order to know the notion of what is that which awares of that something is complex but could also be logically understood with string theory which also discusses the possibility of parallel universes and with the knowledge of our own neighbouring parallel universes, the notion of consciousness would become more significantly clear. The beauty of gravitons could play an important role in unlocking the mystery of not only universe or universes but also of consciousness. With the hope of such possibility , a graviton which is a string not only becomes important but the impact of string theory is underlined ,thereby , philosophising consciousness from string theory could also not be a scope of impossibility.

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